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I.—*On Assaying Silver.—By Lieutenant* Braddock.

1. Until within these few years the art of assaying silver remained almost stationary in Europe, for more than a century and a half. I find by a work translated from the German in 1683, that the furnaces, cupels, muffles, method of preparing the assays, &c. were, at that time, nearly identical with the methods practised at the present day. But, as Sterne says " they manage these things better in France," so we are indebted to the French for a recent improvement in the assay of silver that places it on a footing, as it respects precision of result, more in unison with the present improved state of analytic science.

2. To assay silver, that is, to ascertain the quantity of pure silver contained in a given weight of bullion, there are two ways; by fire, and by acid. The method usually followed by English assayers is by fire, which is the old process; the new French method is by dissolving the silver in nitric acid and precipitating it with a prepared standard solution of common salt. I propose first to consider the old, and then to proceed to detail the new process.

3. The principle on which the assay by fire is founded is this: a given weight, say 15 or 20 grains of silver, is mixed with a certain quantity of lead, placed in a small crucible made of the ashes of burned bones, and submitted for a certain time to a red heat in a small oven which is fixed in a

furnace, and through which there flows a current of air; the lead, and the alloy in the silver become oxidized, and are absorbed by the crucible, leaving, when the operation is complete, a button of pure silver, and the difference between the weight of this pure silver, and the original weight of 15 or 20 grains, points out the quantity of alloy with which the silver was contaminated.

4. This method of assay is defective. In the first place, if any gold be contained in the silver, its quantity remains unknown, and it continues to be alloyed with the silver: I once obtained from a rupee as much gold as was equal to $\frac{1}{12}$th its value. In the next place, the crucible absorbs a portion of the silver, and an allowance is accordingly made for it; but in nice experiments some assayers choose to report the actual weight of the button of pure silver, noticing only that no absorption allowance has been made, which seems to imply, that the exact quantum of allowance cannot be *precisely* fixed: and in the third place, the heat of the fire materially affects results; so that although specimens of silver bullion of the same known quality may be assayed together, the whole of them do not result, as they should do, of equal and uniform fineness.

5. I stated that if gold be contained in silver, the assay by fire does not detect it; the seller of bullion thereby suffers a loss in proportion to the quantity of gold that his silver contains. Silver from the eastward is sometimes rich in gold, and indeed almost all silver contains gold in greater or less quantity. This is a fact well known and acted on in Europe. Silver is not there, now, refined by fire as it used to be formerly, but is dissolved in sulphuric acid, which acts upon the silver, and its base alloy, but leaves the gold untouched in a metallic state, resembling a brown residue, which, when washed and submitted to a red heat, regains the yellow colour of pure gold. The silver which is held in solution by the sulphuric acid is precipitated by iron or by zinc, and when collected, washed, and melted, is found to be silver of fine quality. The gold by this process is therefore saved, and I understand it to be the practice in England for the refiner, if silver is rich in gold, to retain as his fee 8 grains of gold for

each pound troy of silver refined by him, and if there be a surplus of gold, he returns it to the proprietor of the bullion. It is said that the value of 5 or 6 grains of gold covers the expenses of refining a pound of silver. Refining by sulphuric acid is termed the humid process in contradistinction to the method by fire, which is denominated the dry process.

6. The defective nature of the assay by fire, besides its inadequacy to denote the quantity of gold, arises from the difficulty in practice of imparting a perfectly uniform heat to the muffle, or small oven, in which the assay samples are placed. I know cases in which regularly educated assayers have deviated from their own reports as much as one dwt. on silver of the same standard fineness ; that is, to the extent of nearly a half per cent. And although this deviation may be greater than may usually occur, it is a simple fact that it has occurred, and proves the defectiveness of the process ; assayers do indeed say that not more than one fourth of that, or a $\frac{1}{4}$ of a dwt. is the common deviation, but their practice is, not to report nigher than $\frac{1}{2}$ a dwt. or about $\frac{1}{5}$ per cent., which of itself implies that a nearer approximation to truth is not to be expected. In fact were their reports to distinguish $\frac{1}{4}$ dwts. they could not be depended on, as I shall presently shew ; but this seems to be far less accurate than the present state of chemical analysis would seem to indicate as attainable.

7. The following diagram of experiments obligingly made at my request at the Madras Assay Office, will further explain the defective nature of the process by fire. The general figure of the diagram is supposed to represent the assay muffle, and the squares the positions which the assay musters occupied in the muffle. It is only necessary to notice that the silver assayed was of the same known standard fineness, and that where S occurs it denotes that the assay came out standard or correct ; that where the sign of negation — is put, or the sign + plus, the assay varied from the true fineness of the silver and came out minus, or plus, under or above its true quality as the sign denotes. The notation of the differences is in 10ths of a penny weight ; the whole muffle was not filled with musters, which accounts for the blank squares.

+ 2	S			S	+ 4
S	S	— 2	+ 1	+ 1	
S					— 5
		S			
			— 2		
S			— 5	— 7	— 5
		— 2			
— 1	— 2			— 5	— 5

Front.

8. By this it is seen that although each specimen of the silver experimented on, was of the same fineness, yet the assay did not uniformly give that indication, but exhibited one of the musters to be finer than its true quality by four tenths of a penny-weight, and others to vary from one to seven-tenths of a penny-weight in coarseness, making thereby the silver to be worse than it really was. This is attributable, as I before observed, to the difficulty of causing the fire to act precisely at the same temperature on each individual muster: if the temperature was perfectly equal throughout the muffle, there is reason to believe that the variations in the out-turn would be very small, but as perfect equality of temperature is not attainable in practice, perfect results are not to be expected. The absorption allowance is equal to $\frac{1}{74}$ part of the original quantity or assay pound. And as this pound is an arbitrary small weight of not more than from 15 to 20 troy grains, it is clear that a very small practical error will materially affect uniformity of result.

9. To the foregoing diagram I shall add two others, exhibiting the results of experiments made by a regularly educated assayer, for the purpose of determining the allowance that ought to be fixed for the absorption of the cupel; they were made therefore with such care and precaution as

were thought necessary to produce accuracy of result. The notation, &c. is the same as before.

+ 2	S	— 1	— 2	— 2
— 2	— 1	+ 6	+ 1	— 1
— 2	— 1	— 1	S	+ 1
+ 3	— 1	S	+ 4	S
— 1	+ 1	+ 1	— 1	+ 1
S	+ 5	+ 3	— 1	— 1
+ 6	+ 4	+11	+ 6	+ 5
+15	+12	+13	+11	?

Front.

—11	—12	— 9	—12	— 9
— 1	— 7	— 8	—11	—10
— 8	—10	— 7	— 7	— 7
— 7	— 7	— 7	— 7	— 7
— 3	— 6	— 6	— 6	S
S	S	S	S	— 2
— 1	— 3	S	— 1	S
+ 7	S	S	S	+ 3

Front.

10. The examination of these experiments will shew considerable discordancies: and as discordancies occur with silver of known fineness, they will of course occur equally with silver of unknown fineness. In these particular experiments the discrepancies can be traced, because the silver was all of the same known quality; but it is evident they cannot be so traced when bullion of unknown standard is to be experimented on, and its true value to be ascertained. It may therefore be asked how is the true quality of the silver to be known, seeing the capricious results produced by this mode of assay? From the variable out-turn of the furnace, its irregularities would indeed be fatal to all practical precision were they not brought under some controul by a practical expedient, which is, that every time an assay, or set of assays, is made, one or two musters of standard silver are placed in the muffle with the silver under examination, and according as the standard or guide musters come out above or below their true fineness, which is known, an allowance is made for the other musters, considering them to be finer or coarser according to the indications of the standard musters. And by this ingenious method of check the re-

ported value of silver, as ascertained by this method of assay, approaches sufficiently near its true value for the purposes of coinage and commerce. The practical assayer, however, does not depend entirely upon this check: he attends particularly to the fire; regulates the temperature of the furnace; observes the appearances of the assays as they are working off; allows no minutiæ to escape notice during the influential part of the process, which may be about 20 or 30 minutes, and what he thus observes, enables him to report more correctly than he otherwise would be able to do from the simple weight of the assay button.

11. It is clear from these observations that the assay by fire cannot be depended on as giving great precision of result; its general accuracy may be stated relatively as one to 400:—or about $\frac{1}{4}$ per cent. The following table will shew, however, that this limit is exceeded even by the first assayers of Europe. I omit the names of the assayers as they are not essential, remarking only that the samples of bullion sent to them to be assayed, were sent by the French Commission appointed to report on the new process of assay by nitric acid.

Villes.	Titres trouvés aux alliage mathématics de			Observations.
	950 Mill.	900 Mill.	800 Mill.	
Vienne	946.20	898.40	795.10	
Madrid. ...	944.40	893.70	789.20	
Idem.	944.40	893.70	788.60	
Londres ...	946.25	896.25	794.25	
Idem.	933.33	883.50	783.33	Sans compensation.
Amsterdam.	947.00	895.00	795.00	
Utrecht. ...	945.00	896.50	799.00	
Naples	945.00	891.00	787.00	
Idem.	941.00	891.00	791.00	
Hambourg. .	946 $\frac{13}{72}$	897 $\frac{41}{72}$	798 $\frac{44}{72}$	
Altona. ...	942 $\frac{3}{4}$	894.00	790.00	

12. This table exhibits full proof of the defect I have been speaking of. The specimens of silver sent for assay, contained respectively 950.,—900, and 800 parts of pure silver in 1,000 parts, yet none of the assayers report them so fine,

and some deviate from the true value as far as 9,10, and 13 per mille. This discrepancy is large ; it may be loosely stated at one per cent. but the general average is lower, being about or somewhat under a half per cent. ; technically about one penny-weight. I have said however enough to establish what I asserted, viz. that the method of assay by fire is defective ; I now proceed to the new and improved process of assay by nitric acid.

13. I will first give the process as it has been published in French, and then adapt it to English weights. The title of the quarto pamphlet in which the process is described, is intituled, " Commission des monnaies."—" Documens of-" ficiels relatifs a la rectification en France du mode d'essai " des matières d'or et d'argent généralement suivi en Eu-" rope."

Description du procédé.

On a dit que, dans le procédé de l'essai d'argent par la voie humide, le titre de l'argent se determinait au moyen d'une dissolution de sel marin : l'on va indiquer les moyens de composer cette dissolution.

On prendra du sel marin pur et parfaitement sec, ou à défaut, du sel marin blanc du commerce (1) et on en fera une dissolution dans le rapport de 100 grammes du sel à 9143.85 grammes d'eau distillée ; la dissolution étant complète, on la vérifiera, et on en reglera le titre comme il suit.

On fera dissoudre 2 grammes d'argent pur, dans 10 grammes d'acide nitrique à 22 degrés, en se servant du flaçon A. dont on voit le dessin à la figure 1ere. de la planche jointe à cette instruction ; on y versera peu à peu, et en agitant bien, 100 grammes de la dissolution de sel marin (2) ; on bouchera le flaçon, on l'agitera pendant quelque minutes, on laissera eclaircir la liquéur, ou bien on en filtrera un peu sur un pétit

1. Si l'on etait obligé d'employer le sel blanc du commerce il serait avantageux de réduire ce sel en poudre fine et de le laver dans le moins d'eau possible ; il faudrait ensuite le presser entre des linges ou entre des papiers non collés, et le faire bien secher avant de l'employer.

2. On pourra se servir, pour verser exactement 100 grammes de la dissolution de sel dans le flaçon A de la burette D fig. 4 comme on le dira plus bas.

filtré lavé à l'eau distillée; on en versera dans deux verres propres ; on ajoutera dans l'un quelques gouttes de nitrate d'argent et dans l'autre un peu de dissolution de sel. S'il se forme un precipité dans le premier verre, on saura que la dissolution de sel titrée est trop forte ; elle sera trop faible s'il se forme un precipité dans le second verre, et elle sera au contraire bien constituée, si elle n'est louchie ni par le nitrate d'argent, ni par la dissolution de sel marin. Dans les deux cas, où la dissolution de sel marin ne serait pas composée exactement comme on le desire, il faudrait y ajouter peu à peu, soit du sel marin pur, soit de l'eau distillée, jusqu'-à-ce qu'on l'ait amenée, par tâtonnement, au point de precipiter juste 2 grammes d'argent, en employant 100 grammes de cette dissolution : elle sera alors convenable pour faire les essais d'argent par la voie humide.* On n'aura plus qu'à la

* Si l'on voulait s'eviter les tâtonnemens dont il est ici question, il faudrait determiner bien exactement qu'elle est la quantité de dissolution de sel necessaire pour precipiter 2 grammes d'argent pur dissous dans 10 grammes d'acide nitrique. Des calculs fort aisés à faire indiqueraient ensuite facilement ce qu'il faudrait ajouter d'eau ou de sel marin à la liqueur, s'il y manquait quelque chose. Voici quelques exemples qui aplaniront sans doute toute difficulté.

En supposant qu'il ait fallu 104 grammes de la dissolution de sel pour précipiter exactement les 2 grammes d'argent pur, il est évident qu'il y a 4 grammes d'eau de trop par 104 grammes de cette dissolution; il faut donc en enlever ces 4 grammes d'eau par le moyen de l'evaporation, ou, ce qui sera plus facile, ajouter dans la dissolution la quantité de sel marin pur necessaire pour convertir ces 4 grammes d'eau en dissolution titrée. Or, d'après les bases qui ont éte etablies plus haut, ce serait 0.043 gramme de sel qu'il faudrait pour arriver à ce but; il ne resterait donc qu'a peser la dissolution de sel marin que l'on aurait à fortifier, et á y ajouter autant de fois 0.043 gramme de sel marin pur, qu'elle pèserait de fois 104 grammes.

Si la dissolution de sel marin etait trop concentrée et qu'il n'en fallût, par exemple que 95 grammes pour precipiter exactement les 2 grammes d'argent pur, il suffirait, dans ce cas, de peser la dissolution dont il s'agit, et d'y ajouter autant de fois 5 grammes d'eau distillée, qu'elle pèserait de fois 95 grammes.

On peut, en opérant ainsi, s'eviter bien des tâtonnemens. On conseille cependant de ne regarder la dissolution saline comme étant bien constituée, qu'apres avoir plusieurs fois constaté qu'il en faut exactement 100 grammes pour précipiter 2 grammes d'argent fin, dissous dans 10 grammes d'acide nitrique.

renfermer dans une bouteille fermée avec un bouchon de verre à l'emeri, graissé avec du suif et qu'à la garder sous clé quand on ne s'en servira pas.

Voici maintenant la série des manipulations pour assayer un alliage d'argent par la voie humide.

On pèse 2 grammes de cet alliage, on les introduit dans le flaçon A. fig. 1re de la planche, on jauge 10 grammes d'àcide nitrique à 22 dégres dans le tube en verre B fig. 2de ou au moyen de la pipette C fig. 3^m^ on verse cet acide, dans le flaçon A, et on favorise la dissolution de l'argent en plaçant le flaçon sur des cendres chaudes, sur un bain de sable, ou au bain marie. La dissolution de l'argent étant compléte on y ajoute 50 grammes, ou un demi-décilitre d'eau distillée ; on prend la burette D qui est représentée a la figure 4e, et qui est graduée en 100 parties contenant chaque 1 gramme de dissolution de sel titrée ; on remplit la burette jusqu' au zero de sa division, et on en prend le poids bien exactement avec de poids décimaux et en la suspendant à l'un des plateaux d'une balance très-sensible ; on note le poids trouvé et on verse peu à peu, en opérant à l'ombre et en agitant bien chaque fois, de la dissolution de sel titrée dans le flaçon. Il faut opérer lentement, et goutte á goutte vers la fin de l'operation. On agite alors le flaçon plus fortement et pendant une minute ; on essaie la liqueur, et on continue l'opération en tâtonnant ainsi.

Pour que l'essai soit bien fait, il faut que la dissolution de sel ne trouble plus sensiblement la liqueur, et que cette liqueur ne se trouble cependant pas lorsqu'on y ajouter une goutte de dissolution de nitrate d'argent. Lorsqu'on est arrivé à ce point et qu'on l'a bien établi, il ne reste plus qu' à peser de nouveau la burette, qu' à déduire le poids trouvé du poids primitif, et qu' à ajouter un zero à la difference, si le nombre est entier, on à reculer la virgule d'une place vers la droit, s'il est fractionnaire. On obtient ainsi, en millièmes et fractions decimales de millième le titre de l'argent soumis à l'essai. Un seul exemple du calcul à faire dans ces deux cas éclaircira suffisamment ce qui vient d'être dit à ce sujet.

Supposons que le poids de la burette pleine de dissolution de sel titrée de ....grammes	307
Et que son poids aprés l'essai, soit de..........	217
On aurait employé en dissolution de sel........	90

Ce qui representerait exactement le titre de 900 milliémes.

En supposant que la burette pleine de dissolution saline titrée, pesât, avant l'essai	307.56
Et aprés l'essai	217.00
La dissolution employée pèserait........	90.56

Ce qui donnerait le titre de 905 milliémes 6.

14. The method of assay thus developed is founded on strict chemical principles, and depends on the play of chemical affinities. The solution of silver in nitric acid is a test for muriatic acid; and common salt, which contains muriatic acid is a test for nitrate of silver. The two mutually decompose each other. The silver combines with the muriatic acid, and forms an insoluble muriate of silver, and the soda of the common salt combines with the nitric acid and forms a soluble nitrate of soda; and when the relative quantities of each, required to produce complete mutual decomposition are known, the principle of the process is obtained.

15. These relative quantities are found by means of a table of chemical equivalents, thus; the equivalent number of silver is 108·0 and of common salt (muriate of soda, or chloride of sodium) is 58·75:* which means that a solution of 58·75 grains of pure dry common salt, will decompose exactly 108 grains of silver dissolved in acid. From these numbers therefore may be calculated the proportion of salt and of silver required for an assay of any given quantity.

16. Suppose the assay pound should be equal to 10 troy grains; then 5·44 grains of pure dry common salt would be required to precipitate ten grains of *pure* silver: for as 108 : 58·75 :: 10 = 5·44, and if distilled water were added

* Table by Dr. Turner, 1833.

to this quantity of salt to make up the weight of 1,000 grains, it would become a properly prepared solution for the purpose required. This is the theory, but practical difficulties occur which require the solution thus formed to be verified.

17. These difficulties are, first; that as these two substances are most delicate mutual tests, the salt, which imbibes moisture, must be weighed warm, and cannot be weighed with sufficient precision so as to completely decompose the silver and neither exceed nor fall short of it. And secondly, that if it could be weighed with the required accuracy, the foregoing equivalent numbers may not be perfectly correct; some former tables give them at 110 and 60 instead of 108 and 58.75, and the 110 and 60 are extremely near the proportional numbers laid down by the French chemists. But in the quantity of salt required for 10 grains of silver the difference between the two sets of equivalents is but 0.02 of a grain, and an error to this extent might easily be made in weighing at different temperatures. The solution must therefore be verified; and it may be done thus.

18. Prepare a solution of pure dry common salt so that 5.44 grains shall be contained in 994.56 grains of distilled water; *i. e.* 1.000 grains of the solution will contain 5·44 grains of salt, and 994.56 of water. This quantity ought to precipitate exactly 10 grains of pure silver. Dissolve therefore 10 grains of pure silver in 3 or 4 drachms of dilute nitric acid; and when dissolved, add thereto half an ounce of distilled water, and shake it up and mix it well together: then pour in the 1,000 grains of the salt solution, shake it well, let it subside and when clear test a portion with a single drop of nitrate of silver, and another portion with a single drop of the solution of salt. If the prepared solution of salt be of the exact strength, neither one nor the other of the tests will have any effect. But if it be too strong, the test by nitrate of silver will cause a discolouration; if too weak, the other test will do the same. Suppose it too weak and that 5 grains in weight more of the solution are required to produce complete precipitation of the silver; it may then be made of the proper strength either by evaporating it in the proportion of 5 grains in the 1,000; or by adding more

salt, the quantity of which is thus ascertained,—viz. As 1.000 : 5·44 : : 5 = 0.027 the quantity of salt required. If the solution be too strong, then a less quantity of it than 1.000 grains will neutralize the silver; suppose 998 grains are sufficient, then it is obvious that 2 grains of distilled water added to 998 of the solution is all that is wanted to make it of the standard strength.

19. Having prepared a sufficient stock of the standard solution, its use in assay is plain. Suppose the assay pound (10 grains) of silver to be divided into 100 parts, and that the silver to be assayed contained 81 pure silver and 19 alloy. Then 810 grains of the solution would precipitate it, and the quantity of the solution expended would be correctly indicative of the true quality of the bullion. Nor is it of any consequence whether fractions occur or not, for if the silver was 71.54 touch, the expenditure of the solution would then be 715.4 grains; its indications are therefore perfect, and even with a moderate degree of skill in manipulation, the out-turn exhibited by this mode of assay, may, I apprehend, be depended on to a far greater degree of accuracy than the process by fire. I have made several trials with it on silver of known fineness, and found it come out correct within a $\frac{1}{1000}$ part, on the principle of using 1.000 grains of the solution. But if the quantity of water was increased, only retaining the same weight of salt, as much greater precision of result could be obtained, as might be thought desirable.

20. The only practical objection that occurred to me in pursuing my enquiries on this subject was, the tediousness of weighing and of repeated testings; and the time occupied after each testing, particularly when near the point of saturation, before the mixture became clear enough to try it again. But I am informed by a gentleman who was two months at Paris, to learn this method of assay, that neither tediousness nor delay is there experienced, and that the assays are made with sufficient rapidity for the requirements of practice. They do not, however, now weigh the solution of salt, but have their glasses so proportioned and graduated that the quantity expended, can be read off at sight, which is

Utensils used in the Assay of Silver.

Fig. 2.

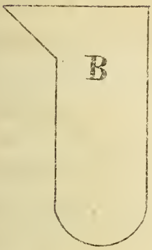


Fig. 1.

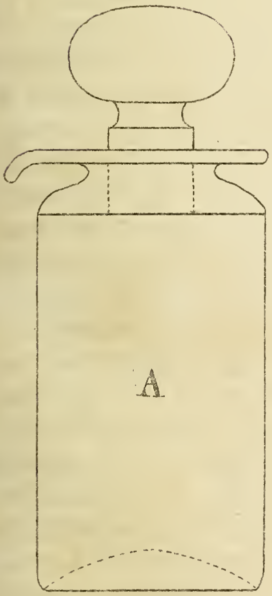


Fig. 3.

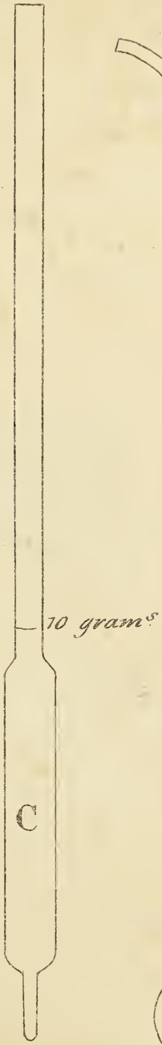
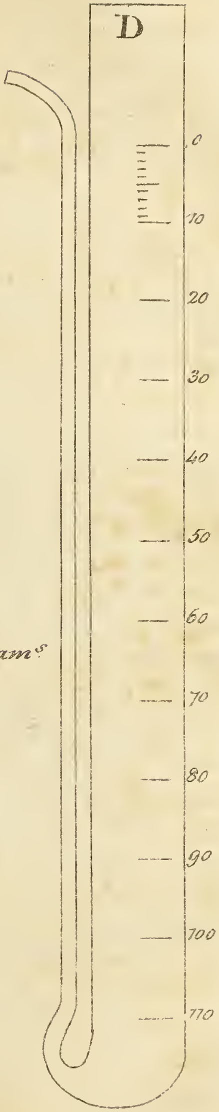


Fig. 4.



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a great facility. And as for the turbidness of the mixture after testing, my informant states that by agitation and sharply shaking, it very soon goes off, and the liquid becomes clear enough for succeeding trials till the point of neutrality is completely obtained. Constant practice no doubt produces facility of manipulation. The French assayers are said to be horrified at the thought of now using an assay furnace.

II.—*Observations on the Flora of Courtallum.—By* Robert Wight, m. d.

(Continued from vol. 2d page 391.*)*

I concluded my preliminary observations on the Flora of Courtallum, with some remarks on the vast variety of vegetable forms which it produces within a very limited space. To enable persons unacquainted with such inquiries to understand the subject more clearly, I compared the number of species, estimated, growing on a very small portion of this range, (20 square miles) with the ascertained number of species, indigenous to the whole of the British islands: and showed a preponderance in favour of Courtallum in the proportion of nearly 4 to 3. Since that time, I have arranged, and somewhat extended my collections, and find they amount to about 1,200 species; three-fourths of which, were collected at one season, and in less than three months. Such a result leaves scarcely a moments room for doubt, that in estimating the flora at 2,000 species, I have not overstepped the truth, as but a small portion indeed of these hills are yet explored, and that very imperfectly. From the data now adduced, I am inclined to advance a step further, and assume, that the Flora of Courtallum within an equal space will be found to equal that of Nepaul, though enjoying a range of climate varying in heat from tropical to arctic. There, within an area of 60 square miles, in the course of one year, the collections of that most active and indefatigable botanist Dr. Wallich, he estimates, did not exceed 2,500 species: showing I think unequivocally, that so far as yet known, no

tract of country of equal size exhibits such a profusion of plants as this does.

The great length of time required to arrange so large a collection, even roughly, embracing as it does from 15 to 20,000 specimens, while subject to the usual interruptions of a professional life, prevented me sooner continuing these remarks, and other, and more pressing avocations, will I fear, constrain me to break them off on the present occasion, at an earlier stage than I originally contemplated.

In this, and my subsequent communications on the same subject, it is my intention to notice as briefly as possible, the leading peculiarities of structure, geographical distribution, and uses, of the several natural orders of plants found here. In these remarks, it shall be my constant endeavour, to adopt a style and mode of illustration, freed to the utmost from technicalities, but without making any sacrifice of science, my object being, to present, in the most inviting garb, her truths to the general reader; in the hope of expediting the diffusion of a knowledge of them, and aiding in establishing a taste for Natural History, a study which, in the words of the accomplished President of the Bombay branch of the Asiatic Society,* "being directly conversant with the works of God, is, in all circumstances, possessed of the highest interest, and conduces both to intellectual gratification and moral improvement; and in such a country as India, so vast in its extent, so grand and multifarious in its productions, is possessed of peculiar charms. The sojourners in Bombay (in India) have in the mountains and forests and Islands of the neighbourhood, innumerable objects, connected especially with Geology, Botany and Zoology, which allure attention, both from their comparative novelty and intrinsic interest. The report of observation and discovery connected with them, would form an agreeable recreation, even to those who may be most ardent and persevering in their researches into the other important objects of the Society's investigation."

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* Vide abridged report of the President's Address.—*Madras Herald,* 10th February 1836.

Influenced by views similar to those so admirably expressed in the preceding extract, I shall proceed to examine in succession the principal natural orders of which I have specimens from this station. In these notes I follow the natural system, not only on account of the facilities which it offers to myself, but in the expectation of being able to elucidate by numerous examples the various benefits which the botanical student derives, from the now nearly general adoption of that method.

Through its means we can often trace affinities of soil and climate, in circumstances the least to be expected, and equally diversities where altogether unlooked for. The examination of a dried collection of plants, will often enable the botanist, without any collateral information, to declare the existence in a country of local causes exerting sufficient force, in modifying the climate, to counteract the effect of geographical situation. For example, many families of plants are only found within the tropics, or in the warmer regions on their confines ; while many others are rarely found to extend beyond the temperate zone. Specimens of both descriptions being found in a local collection indicate as clearly, to the botanist, as if he had himself visited the region, that the plains experienced a tropical climate, while the higher hills enjoyed a temperate one. The first and second orders of the following arrangement, (Ranunculaceæ and Dillenaceæ) afford illustrations of these positions. Of Ranunculaceæ, an extra tropical order, Professor Decandolle describes 505 known species, 119 of which are European, 74 North American, only 19 Indian. Of the 19 referred to India, only three or four are found on the plains, the rest are Alpine, mostly from Nepaul and the Neilgherries. The number of Indian species has been greatly augmented since the publication of his work, but, the additions only tend to confirm the general rule, since they are nearly all from the Himalayas, while 10 of 13 Peninsular species are limited to the Neilgherries, and two of the remaining three found on them. Of Dillenaceæ, on the other hand, 21 of 96 species are Indian, and most of the others are found either within

the tropics, or on their confines. Those of New Holland attain the highest latitude, extending as far as 34° south.

These two examples, though not the most pointed that might have been selected, are, for the present, sufficient to illustrate this important feature of vegetable distribution over the globe. I say important, because it is one which at once enables the botanist to tell from the inspection of a collection of plants, from any part of the globe, and without any collateral information, the character of the soil and climate, the chances of success which would attend the introduction of valuable exotics, or of the removal of such as it might possess to countries more favourably situated for turning them to the best account.

Other and not less important information is occasionally deducible from the examination of the vegetable products of a country; such as the probable salubrity or otherwise of its climate: whether the hills attain an elevation, sufficient to place them beyond the reach, of that almost constant attendant on exuberant tropical vegetation, when unchecked by cultivation—Jungle fever.

Such are a few of the benefits that flow from that, most erroneously so called, dry study of Botany, even when studied in its dryest form—in the cabinet—from dried specimens of plants. I must not however be so far misunderstood, as to be supposed to assert, that, from such data, correct conclusions can always be attained, since it is well known that this country presents an anomaly, strikingly at variance with the general rule, the cause of which remains still unexplained. I allude to the difference that exists, between the hill jungles of the northern and southern extremities of the peninsula, in regard to their healthy and unhealthy seasons,*

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* I may here observe that the direction of the wind has a great influence on the healthiness of Courtallum. On my first arrival here, about three weeks ago, the weather was fine and the climate most salubrious, the wind being at that time about N. N. E. A week ago it shifted round to S. E. and instantly the sickly season commenced, and so energetically, that in less than three days almost every member of the party, nearly 20 in number, was more or less affected, some very severely, with feverish complaints.

a difference worthy the most attentive investigation. In the former the dryest season of the year is the most healthy, and that during which their recesses may be most safely explored; while in the latter it is during the height of the rains; and that too, although the vegetation is much the same in both. But, in both, so far as yet known, the vegetation no where, except on the Neilgherries, presents an indication, of any part of the hills, attaining an elevation sufficient to place them beyond the influence of the fever zone. Some may, and no doubt do, attain an elevation exceeding the nearly ascertained limits of that zone on the Neilgherries, such for example as the Shevaroys, but they have not mass enough at that elevation, to relieve them entirely from its pestilential influence.

In justice to my subject I have thought it necessary to introduce these additional preliminary observations, to show more clearly the object and bearings of such investigations; and, I trust I may add, not without the hope of inducing some of those who have hitherto paid but little attention to such enquiries, to devote some portion of their leisure to such pursuits.

The method or arrangement, which I propose following in these papers, is that of Professor Decandolle. He in place of commencing his systema vegetabilium with the more simple, and rising to the more complex forms, has adopted the opposite course, of commencing with the more complex forms, and descending to the more simple; from their structure and organization being more obvious, yet, though more complex, easier understood.

As every linear arrangement of the series of natural orders must be more or less artificial, this truly great botanist has adopted one, which affords many facilities for discovering the place of any unknown plant, by grooping all the Dicotyledonous orders under four great classes, distinguished, generally, by very obvious characters. In the first (*Thalamifloræ*) the petals are distinct and inserted along with the stamens, when present, below the ovary or young seed vessel (*hypogynous*), without any reference to the number either of stamens or pistils, or whether only one or both are present—their posi-

tion, then, between the calyx and ovarium, but attached to neither, is the distinguishing character of this class. His second class *(Calyciflorœ)*, is equally independent of numbers, as well as of the presence or absence of both stamens and pistils in each flower, but is distinguished by having the petals (whether united or distinct) and stamens inserted into the calyx (*perigynous*). The third class *(Corolliflorœ)* has the petals united, inserted below the ovary (*hypogynous*,) and bearing the stamens ; and the fourth class (*Monochlamideœ*) has a simple perianth, that is a calyx without a corolla, or a single, in place of double, series of parts covering the re-productive organs.

This short explanation of this celebrated system, is introduced to prevent the necessity of after repetitions. The orders, now to be considered, all belong to the first class, or that with distinct hypogynous petals.

I. *Ranunculaceœ.*

I have already spoken of this Order as being almost exclusively extra-tropical, and but for its importance might have been passed over, as I have as yet only found one species here, *Naravelia Zeylanica*, one of the few truly tropical representatives of this family. All the herbaceous members, when found within the torid zone, are observed to occupy the highest hills, where great elevation compensates for a low latitude. This is strikingly the case with *Anemone*, *Ranunculus*, *Thalictrum*, and some others. The shrubby genera such as *Clematis* and *Naravelia*, are more truly tropical, hence we find species of them on the plains of India, Ceylon, the Eastern Islands, west coast of Africa, New Holland and equinoctial America. We may thence generally assume, from the presence of the herbaceous forms within the tropics, that the hills have attained an elevation sufficient to raise them above the limits of the fever zone. Their absence on the Shevaroy hills, were we otherwise unacquainted with the fact, might be received as an indication that they had not attained that elevation.

This Order is readily distinguished from all the others of the class, by having a number of distinct, or only slightly adhering, seed vessels (carpels) and sheathing leaves.

In its properties, " acridity, causticity and poison," form the leading features; hence its species are always to be regarded with suspicion. The bish or bikh of Nepaul, a species of aconite, one of the most active vegetable poisons known, belongs to this order.

It is suspected that that, or an allied plant, possessing similar properties is a native of the Goomsoor country, as a root, somewhat resembling it, was found in some wells, apparently introduced with the intention of poisoning them, and had proved injurious to the health of people who drank the water. The belief that the bikh is a native of that country, can only be viewed as a conjecture, since the roots were so much decomposed, before the discovery was made, that they could not be preserved for examination. I was however induced to make some inquiries on the subject of poisonous roots in this part of the country, and had one brought, said to be so, which proved to be the *Gloriosa superba*; whether or not it is poisonous I have not ascertained, but I did find that a large proportion of its substance consists of pure farina or arrow root. The subject is certainly deserving of further inquiry, and is mentioned here in the hope that some of those employed in that country, will endeavour to procure specimens both of the root and plant. If an aconite is found, most of the European officers will be able to recognise it from its likeness to the monkshood of the English gardens, which belongs to that genus.

II. *Dilleniaceæ.*

This, as already observed, is mainly a tropical Order, for though many of them, particularly those of New Holland, extend several degrees beyond that zone, yet we do not know any that reach a high latitude; and even if they did, a few exceptions would scarcely affect the general rule. Of this family I have as yet only found three species at Courtallum, one of them *Acrotrema*, varying greatly in habit from the other two, and from the rest of the Order; being a stemless, herbaceous plant, growing in moist clefts of rocks; most of the other species are either trees or shrubs. *Tetracera Rhudii*, a very common shrub on the Malabar coast, I have not yet found; though probably a native at least of the passes

leading to that coast : neither have I met with *Delima sarmentosa*, a Ceylon plant ; but I think it may be expected on the higher range of hills, which I have not yet been able to visit. Roxburgh appears, from the Flora Indica, to have been acquainted with only nine Indian species of this order, natives partly of the Circars, Bengal and the Moluccas. Blume describes 8 from Java alone. Two are natives of Senegambia, and six are natives of the Indian peninsula.

In addition to their superior distinct carpels (seed vessels), the principal peculiarity of this Order consists in its seeds having an arillus, or middle coat, if I may so call it, between the capsule and *testa* or true covering of the seed, and by its exstipulate leaves. Most of them are remarkable for their handsome flowers, and some of them attain the size of large timber trees. Roxburgh states that the wood of *Dillenia speciosa* makes excellent gun stocks.

Astringency is the most usual characteristic of the Order, but the calyces of *Dillenia scabrilla* and *speciosa* have a pleasant acid taste, and are used by the natives to season their curries. Roxburgh adds, that they make a pleasant tasted jelly.

III. *Magnoliaceæ.*

Of this Order I have as yet only met with one tree, and that a doubtful native, *Michelia Champaca.* It is an Order nearly unknown on the plains of India. There are however several Nepaul species, and no fewer than thirteen natives of Java.

It is remarkable for the showiness and fragrance of its flowers, and for the bitter aromatic properties of the bark. Some of the Himalayan species are very large trees affording excellent timber. These Mr. Royle thinks might be advantageously introduced into the South of Europe for the sake of their wood.

IV. *Anonaceæ.*

A large and strikingly tropical Order, few if any of its species being known to extend above two or three degrees on either side beyond that zone. India, so to speak, seems to be its head quarters, Dr. Wallich's list of Indian plants, presenting a catalogue of nearly 80 species ; a vast accession

since the publication of Decandolle's Systema Vegetabilium ; at which time only 105 were known, one-fourth of which were Indian. Roxburgh describes 27 in his flora, all that he knew, from both the Continent and Islands. Blume enumerates 32 from Java. After reducing several of Decandolle's species, 19 are assigned to the peninsula, to which I have added fully half as many more since my return to India : so that, the known peninsular species may now amount to 30 ; of these 20 or 22 are natives of Courtallum, and no doubt several more will be found, as they generally frequent the thickest and most shady forests, where, from having nothing very striking in their appearance, or showy in their flowers, they may be easily passed unobserved.

The distinguishing character of this order rests in the seeds, the albumen or white portion of which, as seen in a longitudinal section, is ruminated. This is a mark to which there is no exception, and with the appearance of which, any one may make himself acquainted by merely dividing lengthwise the seed of a custard apple, and examining the cut surface. The custard apple and some others have the carpels united into a single conglomerate fruit. But generally, each carpel is furnished with a distinct pedicel, forming together a large cluster of fruit, all springing from one central point.

Considering the liberal supply which has been granted to India of members of this order, it is to be regretted that in an economical point of view, so far as we yet know, they have so little to recommend them to our consideration. Two species only are mentioned by Ainslie, the *Anona squamosa* and *A. reticulata*, (the custard-apple and bullocks-heart) on account of their fruit ; a few attain the size of timber trees, but the wood is soft and not much esteemed. The family is said to possess, as a general property, a powerful aromatic taste and smell : a point to which I am sorry I have not paid sufficient attention, to enable me either to corroborate or refute, generally ; but I know the leaves of the custard-apple form a striking exception, in so far as smell is concerned, which in them is heavy and disagreeable ; while that of the flowers of *Artabotrys*

odoratissima is most fragrant. The seeds of some of the species are strongly aromatic, those of one, so much so, as to have procured for it in the shops, in Europe, the name of Æthiopian pepper. Another species the *Monodora myristica,* has got the name of American nutmeg, on account of its aromatic properties; and, lastly, Mr. Royle informs us "that the seeds of the custard-apple contain a highly acrid principle fatal to insects, on which account the natives of India use them powdered and mixed with gram, or *Cicer arietinum,* for occasionally washing their hair."

V. *Menispermaceæ*

A small, but not unimportant, Order, and like the last almost exclusively tropical. Most of the species are twining shrubs, some of them of great size, chiefly confined to America and Asia. The Flore Senegambie has only three; and previous to its publication, only five were known from all Africa. Decandolle enumerates 84 species, twenty-two of which are from equinoctial America and thirty-five East Indian. Of the latter several, on more careful examination, proved to be only varieties, and have since been reduced, leaving under thirty genuine species. Blume gives characters of 15 genuine and two doubtful species from Java. A few species are found in the warmer valleys of the Himalayas. Eleven species are referred to the Peninsular flora. The Courtallum one has an equal number; two or three of which are new; raising the number for the Peninsula to 13 or 14 species.

The most striking peculiarity of this Order is, the form and structure of the seed. In all the species there is a degree of obliquity, which in many becomes lunulate, or bent on itself, so that, in place of being straight, the ends of the seed approach each other, till they meet at the foot stalk. Hence, if cut transversely it appears a two celled and two seeded nut, but, when split vertically, is found to have only one long arched cell, somewhat resembling a horse shoe, filled with a single kernel.

The flowers are generally dioecious, small and numerous. The stamens six, distinct, with a small scale at the base of the filaments, as in *cocculus*; or they are numerous, united into

one body, having a round head all covered with anthers, as in *Anamirta (Cocculus indicus);* or there are only 4 stamens united into a square centre column, the anthers opening transversely on the four faces, as in *Cissampelos.* The former genera usually produce three, rarely 6 or more, distinct carpels from each female flower; in Cissampelos only one. In this last, several of these drupes are usually embraced by a broad succulent bractea, producing the appearance of a leafy cluster.

As already observed, this is rather an important Order, in an economical point of view: supplying the London porter brewer with Cocculus indicus *(anamirta cocculus)*, and the physician with one of his best tonics—the Columbo root *(cocculus palmatus)*, among the strongest and purest of vegetable bitters. This most valuable plant is now cultivated in the Mauritius, and was formerly found to thrive well at Madras. It is one of considerable commercial importance, a native of Madagascar, and might, I am confident, be cultivated with advantage in the light sandy soils of this country, much in the same way that yams are, and with equal ease and success. The *Cocculus* (menispermum) *cordifolius,* which has been much extolled as a febrifuge in Bengal under the name of Galancha, is a native of the peninsula, and is common in hedges and among bushes, is another member of this family. Ainslie informs us that the tender shoots of this plant, which are bitter and a little nauseous to the taste, when dried and powdered, are prescribed as an alterative in jaundice and depraved habit, by the Hindoo practitioners, and, on the authority of Dr. Fleming, that the leaves are febrifuge. In the Materia Indica he adds, that from 15 to 20 grains of the root is a powerful emetic, and is much used in the Chittore district in cases of snake-bite. It is the root which is used in Bengal against fever. It seems to possess the properties of ipecacuana in an eminent degree. Under *Cissampelos pareira,* Ainslie speaks very favourably of the medical properties of the root of *cissampelos convolvulacea,* a very common Indian plant. He says that it is a very agreeable bitter and stomachic, frequently prescribed by the natives in the latter stages of bowel complaint.

From these data, I think we may safely infer, that nearly the whole Order possesses strong tonic and febrifuge properties, and that many of the species may at all times be safely substituted for the better known and more highly esteemed, but costly, cinchona, in the cure of fever, when it (cinchona) is not procurable.

VI. *Nympheaceæ.*

Of this small but beautiful and interesting family, (the water lilies), the flora of Courtallum can only boast of one, or at most two, species. It is a curious circumstance in the history of this Order, that, though found in almost every part of the Northern Hemisphere, it is rare in the Southern, and is almost unknown in South America.

In an economical point of view little can be said regarding it. Generally I believe over India, the roots dried and roasted are eat by the natives. In some parts of Bengal the seeds also are eaten, sometimes alone, at others powdered and mixed with flower. Mr. Royle states that they are occasionally prescribed as a diet by native practitioners in some diseases: and the authors of the Flore Senegambie state, that both the roots and seed are commonly used by the poorer natives of that coast, especially in times of scarcity; and that the wild hogs come in droves from their coverts during the dry season in search of the roots.

Botanically considered this Order is one of much interest, and has given rise to many warm discussions among botanists as to its structure and affinity. These it is not my intention to dwell upon. I shall, however, avail myself of the opportunity which it affords, of illustrating a not less curious than important botanical fact; one which has been long observed, though its practical application to science is a recent discovery. I allude to the doctrine of metamorphosis of organs.

This doctrine lays it down as an axiom, that different parts of the flower and seed vessel are all modifications of leaves, that under particular circumstances they may, and actually do, revert to their original form, and, lastly, that the complex congeries of parts forming a perfect flower, are the undeveloped elements of a branch. According to this view, each segment of the calyx is a modified leaf, and the

whole together, whether distinct or united, few or many, a whorl or verticle of such leaves; that the petals are equally so many leaves, more completely changed, and that the stamens and pistilla, are all leaves more and more altered from the original form. That this is actually the case, there can now scarcely exist a doubt, as every one of these parts has in repeated instances been observed, more or less perfectly, to revert to its original form. Indeed, it is almost impossible to examine a double flower, without discovering some trace of what is here stated. In the common double rose many of the centre petals have half an anther on one edge, the filament and other half having expanded into a petal. In the same way, in the double shoe-flower, nothing is more common than to find one, or more, of the pistilla transformed into a leaf, representing in miniature those of the shrub. The nympheas show this transformation even more strikingly, because it may be traced in every part of the flower. Thus it is generally difficult to tell where the calyx ends and the petals begin; and between the petals and stamens there is usually a number of bodies that are neither petals nor stamens, but partly both. As it would be out of place to go into a lengthened examination of the question of morphology, I have merely introduced these instances for the purpose of directing the attention of those curious in such inquiries to the subject, but cannot drop it without adding the practical deduction which has been drawn from the facts here, perhaps too briefly, stated. It has been already mentioned that, according to this theory, a flower is an abortive branch, the parts of which, in place of being developed in the usual way, are condensed into a new and highly complex organ, the flower. Hence the sterility of fruit trees in very rich soils, by the too exuberant vegetation converting flower buds into branches. Those who wish to know more on this subject will find it, in all its details, most ably elucidated by Dr. Lindley in his Introduction to Botany, the best elementary botanical work in the English language.

Passing over Papaveraceæ and Cruciferæ, as having no indigenous representatives in this flora, I shall in my next proceed with Capparideæ.

III.—*On the solidifying, or induration of Chunam.—Communicated through Lieutenant* Braddock.

Lime or Chunam as it is called by the natives is in chemical terms the oxide of Calcium, supposed by analogy to be a metal combined with one portion of oxygen. It is also designated an alkaline-earth, because it has the property of altering the vegetable blues to red, and turmeric, brown, like the mineral and vegetable alkalis. As it is found in nature, it is always combined with a gaseous acid, the carbonic acid, the sulphuric, phosphoric, and some others. The first combination is the marble of the statuary,—the shell of which the Indian chunam is generally made,—it is the common chalk; the second is the plaster of Paris, of which casts are made,—it is the alabaster or selenite, of which vases are made and small figures;—the phosphoric is that combination with lime, which constitutes the human and other bones: there are other combinations, such as the fluate of lime, or Derbyshire spar.

Lime in itself and by itself possesses no indurative or binding property; it must be combined. Lime is not found as an oxide of the metal, calcium,—it must be reduced to that state by the expulsion of the acid with which it is combined,—it is then what is called unslaked or caustic lime; it is by the action of fire that the carbonic acid is driven off. Lime possesses a great affinity for water and is capable of taking up and solidifying a considerable quantity, evolving much caloric at the same time: having gone through this process, it becomes a hydrate, or slaked lime, retaining still its causticity, or capacity for combination with, and power to decompose vegetable and animal matter.

In this state, it has no indurating or cohesive property, it is friable, it must be in combination; and its great affinity is to silex or sand, to this substance it mechanically attaches itself with great avidity, and forms what is commonly called mortar or cement; but it is necessary that water should be the medium by which the minute particles of each should be brought into full and equal contact: there is no doubt

that when masonry is excluded from external heat, as it is in works of thick masonry, it solidifies a further portion of the water—therefore it is inexpedient to submit works to the effect of a higher temperature, or rather say to allow it to dry too rapidly.

But this is not sufficient to give it the indispensable quality of induration, on which strength and permanency depend. The lime as far as has been shewn is only an hydrate combined mechanically by the aid of water,—there is another principle wanting—that is carbonic acid. It acquires this from the atmosphere gradually, where other means are not employed to impart it more rapidly—in some places charcoal is added, and it is very often worked up with impure matter; for pure lime is not considered to form the best cement: the purest chunam or lime is obtained from shells. At a distance from the sea coast where these beds or strata of shell are found, what is called stone chunam is used, and is as good as that of shell for masonry, although the native bricklayers prefer the shell. In this part of India the use of jaggery dissolved in water universally prevails, and although it does, there is not a maistry bricklayer, nor even persons who know more, can explain the rationale of its use: some say that it gives an adhesive property from its clamminess—some say that their forefathers used it and so do they their successors; others laugh at the use of it and pronounce it to be an unnecessary ingredient and reject it altogether. There is no doubt that its use may be dispensed with; the Madras Engineers it is believed have exploded it altogether, as a measure of economy.

If we in our days, are more cunning than our ancestors they were more wise;—no doubt they had their rationale, but like the ancients kept the secret to themselves. We give ourselves great credit for our discoveries, but there is good reason for believing that we are only reviving a knowledge of things lost. But there is great sense in the application of jaggery or sugar water. Modern chemists have discovered the ultimate elements of sugar to be carbon, oxygen and hydrogen. Here we find a grand source and an abundant supply of carbonic acid, or at least the elements of

it. They have further discovered that lime is more soluble in a solution of sugar, than in water alone : the lime decomposes the sugar, sets free the gaseous carbon and oxygen which combine in the proportion to form carbonic acid, and the lime having a very strong affinity for the carbonic acid attaches it, and thus united with the indurating principle, or with that gas which gives hardness to the lime, it becomes that hard and imperishable matter that it is found in all buildings properly built, particularly in old Indian masonry of brick and lime. If we examine a fresh brick it will be found brittle and light—but examine a brick of old masonry, it is as hard as granite.

There is another purpose gained by this combination. Bricks are made of clay, silex, and a certain portion of oxide of iron, scattered by nature over and among matter, and which gives the red colour to bricks ; these are porous and capable of absorbing moisture—they consequently absorb the jaggery water holding the lime in solution, this water in the brick acts the same part that the unabsorbed jaggery water does with the lime and sand, and forms within the brick and in its pores a similar cement to that which binds the bricks together, binding the minute particles of the brick, and this accounts for the intense hardness of all the old Indian masonry.

In this country where the temperature is so high, evaporation rapidly takes place. Moisture is necessary to assist the lime in attracting and holding carbonic acid, therefore some extraneous aid must be given which is afforded by the jaggery ; and further, masonry is so thick in general that the carbonic acid that is always floating in the atmosphere would be years, if it ever reached the interior work. In Europe sugar is too dear to use, and on that account it has never been used ; but hair is used in plastering to keep mortar together.

If a better rationale than the foregoing can be given, or if there are errors in the conclusions drawn, it would be adding to knowledge if it were afforded, and those errors pointed out.

Suggested—that a piece of well burnt brick, say three inches square be taken, and ascertain what degree of weight it will require to crush it. Take another piece of brick of similar dimension, and let it be weighed,—let it remain immersed in a solution of lime and water for 24 hours—take it out, let it dry for a month or more, then weigh it—ascertain what it has gained in weight—and try what force it will require to fracture it as in the preceding.

Take a third piece and weigh it—then immerse it in a solution of jaggery water, to which lime has been added—and which has dissolved as much lime as it is able; let it remain 24 hours, take it out and let it dry well for a month or longer, weigh it—and then subject it to pressure—and ascertain whether it will fracture at a less or greater weight than the other.

Take an ounce of worked up chunam without jaggery—expose it to the open air until dry—put it into a retort—add muriatic acid, apply the retort to a receiver over the pneumatic trough, see what quantity of carbonic gas comes over.

Take a similar quantity worked up with jaggery water, let it dry for a week or longer and do the same with it as the preceding—these experiments will shew which is carbonated the soonest and the most.

Note.—The ingenious writer of the foregoing paper has taken up a subject which is well deserving notice and further investigation; and in connexion with it might be investigated the causes of the decay of modern brick and chunam masonry, compared with the hardness and durability of work executed 50 years ago. The use of jaggery in chunam is frequently set aside when buildings are executed by the Engineer's department; we should be glad to be favoured with the details of any experiments that have been made, tending to shew the grounds of this new usage. From a few experimental facts within our own knowledge we are inclined to believe that this departure from native practice is not to be commended.—J. B.

IV.—*On Native Education.*

The subject of Native Education, has of late years attracted a considerable degree of attention at the sister presidencies of Calcutta and Bombay, and much surprise has been expressed that similar interest has not been excited on this side of India. The department of Public Instruction at this Presidency is under the superintendence of the College Board, and we have reason to know that those gentlemen have been most anxious to forward the important object confided to them. In the year 1826, particular measures were adopted with the view of training up a better description of teachers and of improving the system of education, which has hitherto prevailed in the provinces subject to this Presidency; but as, after several years trial, neither of these objects have been obtained to the extent anticipated, it has recently been deemed expedient to have recourse to a modification of the system, which it is hoped may lead to more favourable results. As, however, the adoption of the suggestions of the College Board would be attended with some additional expense, it is necessary, under the existing state of things, that the sanction of the Supreme Government should previously be obtained; and it remains to be seen whether the interest which has been evinced for the furtherance of education in Bengal, will be extended to this Presidency. The following extracts from an able minute of Mr. Campbell, the senior member of the College Board, on the subject above referred to, appearing to us to contain much information that will be interesting to the generality of our readers, we have ventured, with his permission, to communicate them to the public.

" The original object of the College was to facilitate the acquirement, by the junior Civil Servants, of the numerous languages peculiar to the South of India.

" On its first establishment, the non-existence of a single English elementary work upon these languages, and the impossibility at that time of procuring even incompetent teachers, amongst a people in general ignorant of the grammar of their own tongues, were the principal obstacles to their ac-

quisition. But, a uniform standard of qualification in them, sufficient for the duties of the public service, was also to be established, by requiring all, previously to entering upon public duties, to be certified as qualified, by the same collective body, guided by systematic rules.

"The most gratifying success has hitherto attended this branch of the institution. The liberal encouragement held out by Government has stimulated many gentlemen to the publication of English elementary works, on the Tamil, Carnataca and Teloogoo, the three most prevalent languages, and even given rise to English translations and grammatical illustrations, of some of the most difficult moral compositions in the classical dialects of these tongues. An extensive and intelligent body of native teachers has been formed for these languages, as well as for Malayalem, Mahratta, Sanscrit, Hindoostanee, Persian and Arabic, who are grammatically versed in English, and possess a critical knowledge of their own tongues; and many of them, by their talents and acquirements, have gradually been raised by their former pupils to the highest civil offices filled by natives—whilst a knowledge of the native languages has, by these means, become now nearly universal amongst the members of the Madras Civil Service.

"After good elementary books and competent teachers were procurable in sufficient number to be sent into the interior, it was no longer necessary to retain the junior Civil Servants at the Presidency; where, during the gradual formation of both, it had been requisite at first to assemble them, in order to be within the reach of the best of each previously attainable. The expediency of stationing them universally in the interior, as soon as possible after their arrival in India, has ever appeared to me unquestionable. It not only withdraws them from the allurements to dissipation, inseparable from a metropolis, but even deprives them of the means of indulging in expensive habits, which formerly terminated, too frequently, in the sacrifice of their independence as public men. Above all, it brings them, at a period of life when novelty gives additional excitement to curiosity, in contact with the interesting people whom they are destined to rule; and

affords them an invaluable opportunity for ascertaining their familiar habits, peculiar feelings, and true sentiments, which, unreservedly communicated to others, are too apt to be concealed, or dissembled, before any one clothed with public authority. It is a knowledge of the natives thus acquired, before entering upon public life, which forms the best foundation for that indulgent consideration towards them afterwards, that ought ever to characterize our civil polity in India.

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" On the first establishment of the College, such was the deplorable apathy and ignorance prevalent amongst the people, that it was requisite, not only to instruct the candidates for the situation of teacher in their own languages, as well as in English, but to bestow upon them salaries, to hire them to learn. The result of my recent examinations at the College clearly proves that this is no longer necessary. In each of the languages, I found several unpaid natives, studying expressly for the office of teacher; and, by a tolerable acquaintance with English, as well as a critical knowledge of their own tongue, well qualified to hold the situation to which they aspire.

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" From the want of that attention and encouragement, on the part of the ruling power, without which learning never flourishes in any country, it had so long sunk into a dormant state in the Peninsula, that if competent teachers of the spoken dialects were not procurable, still greater difficulty was experienced, in filling up the high situations of Hindoo and Mahomedan Law Officer in our courts of Judicature, requiring a knowledge of law and its sister sciences, buried in the profound depths of Arabic and Sanscrit lore. Accordingly, the Hindoos at first, selected with the utmost care, were too often found, on trial, ill qualified for the offices they filled; and not a single Mussulman being discovered in the Madras territories capable of this employment, it was necessary to send to Bengal for Mahomedan Law Officers, who arrived here necessarily as ignorant as Europeans of

the various languages spoken by the people under this Presidency. To remedy these evils, the College were next directed to educate a class of natives of the Madras territories, versed in its vernacular languages, in the several branches of Sanscrit and Arabic science, requisite to qualify them for employment as Hindoo and Mussulman Law Officers in our Courts.

" It is pleasing to state that in this branch also of the College, the success has been complete.

" Of the native Law Officers in the interior, most of whom as Sudr Ameens, now both adjudicate civil suits and conduct criminal trials, the far greater number are individuals educated in this department at the College, and of ten Bramins and ten Mussulmans now holding the twenty-paid fellowships in the law department of the College, who are to succeed to these employments as they fall vacant, there are at present only three Mussulmans who have not obtained the established certificate of qualification, for the high situations which they are destined to fill.

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" Of the ten Bramins holding half of the fellowships in question, each of the 5 first received in addition to his own salary of 20 Rupees, a further sum of 20 Rupees per mensem, or 100 Rupees altogether, the salary of the former deputy Sanscrit master being divided amongst them, as sanctioned by Government on the 3d May 1831. But, I found on inquiry, that these five individuals did not teach more than 20 students, half of whom are mere children, and that the head master alone is fully adequate to instruct the whole Sanscrit class, consisting only of 35 persons.

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" Of the five first holding the corresponding Mussulman Law fellowships, two at Madras, and a third at Arcot, receive, in addition to their salaries of 20 Rupees each, 9 Rupees per mensem as Tahsildary teachers. The result of my examination of the scholars, under the two who profess to teach in this capacity at Madras, convinced me that their exertions as masters have been little more than nominal.

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"The attempts hitherto made at the improvement of public instruction, the most interesting, if not the most important, department under our charge, exhibit so lamentable a contrast with the success attending the other branches of the institution, and with the great progess made in the improvement of native education at the two sister Presidencies, that I consider the honour of the service seriously implicated in our redeeming from censure and reproach the public body to which we belong, by placing this branch of the institution under us in an acknowledged state of more progressive advancement.

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"The *exertions* of the Board in this department have hitherto been directed—1st, to the establishment at the Presidency, of a central seminary, for the proper instruction of paid candidates, entertained for the situation of Collectorate teachers at the principal schools to be established in the interior of the country—2dly, to the actual introduction, under these persons, of some of these principal or Collectorate schools into the provinces—3dly, to the establishment of subordinate or Tahsildary schools there—and, 4thly, to the composition of improved elementary works on the native languages, with the view of rendering the general system of instruction more consecutive in its stages; and to the distribution of approved English and other works throughout the country, in communication with the School Book Society. Reversing the order in which these have been stated, I proceed to offer to the consideration of my colleagues a few observations upon each.

"As explained in a report which I laid before Government when collector of Bellary, the grand defect in the education of the natives throughout the South of India is, that whilst they learn to write and to read mechanically, the intellect is restrained from the exercise of its natural powers, and the heart deprived of those all important moral impressions, which can be fixed indelibly only in youth, merely in consequence of every school-book used being in a dialect of which the learner is profoundly ignorant. This is the case not only in all the Hindoo schools as there explained, but in the

Mahomedan schools also; for the Koran, in its original Arabic, is the only book first placed in the hands of every Mussulman boy.

"Capt. Harkness, our late Secretary, has the merit of having done his utmost to remedy this crying evil. Under him the College head masters, and others, prepared a series of elementary books in Tamil, Teloogoo, Hindoostanee and Sanscrit.

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"The number of these books which have been sold (2,358) shews that their value has been appreciated by the natives; and that the attempt, so far as it has gone, to introduce into the native schools books intelligible to the learner, has been successful. But it appears to me that the books themselves admit of great improvement; and that, thus improved, the distribution of them should be attempted on a much more extensive scale.

"The whole of these consecutive works might, with much advantage, be compressed into a single volume in each language, for they are at present unnecessarily numerous and complicated. The alphabet of each language should be given in the largest character—then all the different combinations of letters used in the language, omitting such as never occur in it, some of which have found their way into these books merely because they occur in other tongues. A few pages may then be devoted to words of one, two, three and more syllables respectively; and the book should close, like an English spelling book, with moral verses and moral tales, such as children can easily understand and get by heart, and such as may be calculated to produce salutary impressions on the youthful mind. I am not sufficiently master of the language to pronounce a judgment as to the successful execution of this last part of Vencatachella Moodely's *Tamil* works—but the novel attempt he has made, to convey to native children lessons of morality in verse, in the colloquial dialect of the Tamil language, though a humble, is a powerful means for the promotion of virtue and useful knowledge, deserving of the utmost encouragement.

"As all native books commence with an invocation to the deity, it ought not perhaps to be dispensed with in these books, but it ought to be couched in general terms, such as may be applicable to every religion, otherwise bigotry has been carried so far, I am ashamed to say, by men calling themselves Christians, as, for this reason alone, to exclude some of these books from use; and the universal popularity which it should be our object to excite in their favour, may thereby be partially defeated.

"Whilst we thus endeavour to give a beneficial impulse to the mind of the rising generation, generally by newly combining advancement in useful knowledge, and salutary moral impressions, with the mechanical arts of writing and reading, which alone have hitherto been taught to them; let us not neglect to satisfy the thirst for improved education, and European science evinced amongst the higher and more cultivated classes of the native community. The mode in which this should be done, so far as the supply of books is concerned, appears pointed out to us by the past experience of the School Book Society.

"In 1823 that Society reprinted at Madras 500 copies of Joyce's English Scientific Dialogues. In 1830 they printed 500 copies of it in the Tamil language, incurring a very heavy additional expense for its translation. Of these the price is the same, and there have been sold of the English translation 285, of the Tamil 28. Of the former there are now in store 215; of the latter 472 copies.

"This shews that the demand for the English work is six fold greater than for its Tamil translation, the annual sales being on an average 24 of the former to only 4 of the latter. It would be difficult to find a more decisive proof than this, of the expediency of giving the preference to English as the medium for communicating to the people, a knowledge of European literature; and in order to excite amongst the more learned natives, versed only in the higher classical works of their own language, a taste for English literature, I would place in their hands such books as Mr. Ellis's translation of the

Korul, or Mr. Stokes' of the Nidineri Vilaccum, in which also the original text is given in the native language.

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" Of the Tahsildary or subordinate schools, 61 in the interior, and 9 at the presidency have been established, at the expense of 9 Rupees each, for the teacher's salary, or Rupees 6,480 per annum for the whole. About 2,200 scholars were stated, in our letter to Government of the 15th November 1832, as then studying at these schools.

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" I regret to be obliged to state my reluctant conviction, that the establishment of these schools in the provinces, has been entirely premature, if not prejudicial ; and that no further steps should, for the present, be taken for their extension. Until we are better provided with a stock of adequate teachers for the superior or Collectorate schools, we cannot hope with success to establish even these principal seminaries ; and as it is to them, chiefly, we must look for the formation of competent instructors to preside over the inferior schools, it is straining in vain at an object beyond reach, to attempt establishing them satisfactorily, before teachers competent to preside over them are formed.

" The premature establishment of these Tahsildary schools, indeed, appears to me to have been even injurious to the character which we should endeavour to create for all the Government seminaries, and calculated to degrade them in public estimation. They are, says the principal Collector in Tanjore, " some degrees worse than the common village schools, " from which they differ in no respect, except that the master is more careless from his independence of the scholars, " whose parents are content that they should get a worse " education at a cheaper rate, than the sons of their neighbours. Were a system of rational instruction established, " and strictly enforced by the constant supervision of a competent person, with authority to punish and reward the " school-masters, according to the progress made by the " scholars, the occasional visit of a Collector or other European functionary would have a useful effect ; but any one " practically acquainted with the subject, must be aware of

" the impossibility of a Collector devoting a sufficient porti-
" on of his time, to the establishment or enforcement of such
" a system ; and his visits, at present. do nothing more than
" lend the sanction of his patronage to the worst schools in
" the district, without even the consolation of supposing
" that, bad as it is, an education is given to those who would
" otherwise have none ; for I do not believe that these
" schools are attended by a single individual whose parents
" would not pay for his education elsewhere, were they abo-
" lished to-morrow."

" Believing, as I do, that this is a correct account of the Tahsildary schools generally, I strongly deprecate their further extension for the present ; for I believe that the sole good arising from them has been, that all alarm against Government interference with public education, so characteristic of the people in the South of India, has been prevented, by leaving the selection of these Tahsildary teachers to themselves.

" But, whilst the machinery requisite for the efficient working of the Tahsildary schools is under preparation, we should not be justified in delaying some effort for the immediate improvement of the very defective system of education, prevalent throughout the provinces. The returns made by the Collectors in 1823 shew that no less than 12,498 schools already exist in these territories ; and, instead of adding more to their number, at the expense of Government, I would submit that we should endeavour to improve and render efficient those which exist, and are voluntarily supported by the public.

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" Of the nine Tahsildary schools at the Presidency, the Tamil and Teloogoo schools alone are in an efficient state, such as reflects honour on their teachers and their visitors, the head Tamil and Teloogoo masters at the College. They are attended by numerous children, generally from 15 years downwards ; one by as many as 57 pupils. Several of the scholars have been attached to them for 4 or 5 years, and have thus become masters of the language they have studied. In one of these schools the use of the new Tamil elemen-

tary books had been discontinued, under a belief that they were discountenanced by the head Tamil master at the College, though they were deemed by the master of the school himself preferable to any other ; but they are in universal use elsewhere, amongst the presidency Tahsildary schools. Of all the scholars, a little girl of pure caste, grand-child of one of the Hindoo masters, particularly attracted my notice, from the singularity of such an occurrence here. I hope her example may be followed by others of her sex, and that here, as in Bengal, females will no longer continue excluded from learning. It appears to me particularly desirable that these Tamil and Teloogoo Tahsildary schools at Madras should be extended, as subordinate branches of the great central seminary to be established at the Presidency ; for we have them here within our reach, and under our own personal supervision ; and they may thus be made the models upon which the subordinate schools in the interior may hereafter be fashioned, if not the nurseries for teachers at these more distant future seminaries. As it is of importance that these schools, where useful, should be supported by voluntary contributions from the public, in addition to the Government retaining fee of 9 rupees per mensem, I recommend that it be clearly explained that the masters are not bound to teach any, except the children of the poor, unless the parents consent to give the same fees for their children, as are usual in other native schools. This will make the situation of the masters more profitable and respectable, and the value of the fees realized will enable us to judge of the respective estimation in which the teachers are held by the public. I saw several children at these schools, whose parents are in easy, if not affluent, circumstances, and the teachers complained that it was understood that Government discouraged their receiving fees.

" With regard to the provision of school rooms and stationery, for the use of either the Tahsildary or the Collectorate schools, the expense would be enormous, and is by no means requisite. Europeans, in this respect, may with advantage take a lesson from Hindoo simplicity. The shade of the spreading banyan tree, to be found in every village, is in

this climate the most wholesome and convenient, as it ever will be the most appropriate and beautiful scene for the village school, and the sand beneath it renders stationary altogether unnecessary. The little girl above alluded to spelt, with her finger on the floor of the College Hall, every word I mentioned; and though there was no sand on it, she, with the tenacity of habit, obliterated each word as she spelt it, as if there had been sand upon the floor, to prepare it for the word that was to follow—where such materials have habitually been used by the people for ages, to supply our schools with the novel luxuries of pen, ink and paper, would merely be to organize a system of petty but universal pilfering upon the public stores by the teachers, whose moral character it should be our object to guard from, not expose to, such corruption.

"The number of paid candidates for the situation of Collectorate teachers now educating in the College is 22; others, to the number of 14, have been sent thence into the interior, to form the principal Government provincial schools, intended to be established in each Collectorate; making a total of 36, each of whom receives rupees 15 per mensem. The aggregate annual expense on this account is, therefore, rupees 6,480. There is nothing which reflects such disgrace upon the institution, as this branch of it.

"Of the 14 persons in this capacity deputed into the interior, the only notice I can find is in our letter to Government of the 15th Nov. 1832, where only 5 of them are mentioned as "qualified to act as instructors to others," but not "sufficiently advanced to be employed as teachers in the provinces;" and in the recent report from the principal Collector of Tanjore, who says, "I consider it my duty to inform you that the "school master, appointed to the Collectorate school in this "district, is entirely unfit for the situation, both in natural "abilities and literary acquirement, and that at least a score "of persons might be found in this province, any of whom "would fill it with much greater efficiency, who have never "had the advantage of a College education." Under such circumstances, I fear that the deputation of these 14 persons into the provinces has answered no purpose, except to bring

into disrepute the branch of the institution, to which they have too long been suffered to belong.

"Of the 22 candidates for these situations also in the College, though some of the Hindoos have made considerable advancement, and are likely to prove valuable instruments in our hands, all are deficient in a knowledge of English, especially the Mussulmans; and many of them are dull men, ill fitted for the situation, upon whom the labour of tuition is a fruitless waste of time.

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"Mr. Stevenson states, that experience taught the Bengal Committee the inexpediency of uniting, in the same person, the duty of instruction in both oriental and european learning. This appears confirmed by the failure of the Collectorate teacher-class here, which, in addition to the causes above stated, may be also attributed, in part, to a similar error of ours, in attempting too much at first, by aiming at the union of both qualifications in the same individual.

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"In the English head master, Mr. White, we possess a zealous and active man, who to the extent of his own qualifications has ably instructed his pupils. But he is attended by a host of what are called general students, or unpaid pupils, seeking with avidity instruction in English, and some of these, being more distinguished by talents, intelligence and zeal, than the paid Collectorate students, are apt to divert him from the tuition of the latter.

"I was particularly pleased with the advancement which several of these general unpaid students have made in English, Geography, the use of the Globes, Algebra and the first elements of Mathematics, and find that our Secretary, Mr. Rowlandson, with praise-worthy zeal, has devoted one day of the week to the instruction, in these branches of study, of a few of the most advanced English pupils. One young Hindoo, the son of a native military officer, I particularly remarked, who is quite master of English. By zealous study he has acquired so much of the genius of our language, as to have attained a distaste for his own, and though he translated most fluently into English from his own language, no

solicitation whatever on my part, could induce him to attempt giving the meaning of English in his own tongue. He said that he disliked his own language, that he spoke it at home, but that, as he did not understand it grammatically, he must decline translation into it.

"I propose that, if the increase of pay to Collectorate teachers, upon qualification, be sanctioned by government, a general examination be held at the Presidency, to be attended by the whole of the present Collectorate teachers in the interior, and the Collectorate students at the College, and any others who may be induced, by the increased pay eventually to be granted, to become candidates for the situation—that we then proceed to purge this class, by selecting from the whole, only such as possess good natural talents, and are most distinguished by a knowledge of English, augmenting the class gradually hereafter as far as 100—that, in addition to our present English establishment, we apply to government to obtain from the Honourable the Court of Directors the nomination of a Professor on 12,000 rupees, and a deputy on rupees 4,200 per annum, as general superintendents of this branch of the institution, capable of affording the pupils instruction in Mathematics, Natural Philosophy, and European literature in general: and that, until their arrival, we be authorized, temporarily, to fill these situations by the most competent persons to be procured, on such salaries, within these amounts, as we may find practicable.

"From the statement given by me in a previous part of this minute, it will be perceived that these, and all the other additional expenses proposed by me, to render efficient this most important and interesting branch of the institution under our charge, will not exceed an expenditure of Rupees 103,150, for the improvement of public instruction, throughout the extensive territories under the Government of Madras. The Honourable the Court of Directors have authorized funds being placed at our disposal adequate to the object in view, and, in laying before the Board the following return submitted by the India House to Parliament, I refer to it with confidence to shew, that, compared with the liberality which has distinguished the sister presidencies for this

purpose, especially of late years, the amount I have estimated by no means exceeds the just proportion due to our native subjects, in this extensive portion of the Indian dominions of Britain.

" *An account of all sums that have been applied to the purpose of educating the natives in India, from the year* 1813 *to the latest period to which the same can be made out, distinguishing the amount in each year.*

	Bengal.	Madras.	Bombay.	Total.
	£.	£.	£.	£.
1813	4207	480	442	5129
1814	11606	480	499	12585
1815	4405	480	537	5422
1816	5146	480	578	6204
1817	5177	480	795	6452
1818	5211	480	630	6321
1819	7191	480	1270	8941
1820	5807	480	1401	7688
1821	6882	480	594	7956
1822	9081	480	594	10155
1823	6134	480	594	7208
1824	19970	480	1434	21884
1825	57122	480	8961	66563
1826	21623	480	5309	27412
1827	30077	2140	13096	45313
1828	22797	2980	10064	35841
1829	24663	3614	9799	38076
1830	28748	2946	12636	44330

" Madras ought to take shame to itself for its backwardness in the cause of native education, as exposed in the above return to the British Senate; and as no other public body can exculpate it from this reproach, except this Board, I have considered myself bound, as its senior Member, though sensible of my inability to perform the task adequately, to sketch the outline of a plan for the improvement of public instruction, such as may be modified and matured by my Colleagues. Whilst it embraces a gradual improvement in the education of the mass of the natives generally, by converting the symbols of sounds not understood, into the medium of conveying instruction to their minds, and moral impressions

to their hearts, its chief object is to open, to the higher and more influential classes of the community, access to a new and superior quality of knowledge, through the medium of the English language and the sciences of Europe."

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V.—*On Syrian Roofs.—By* M.

It has very erroneously been supposed that white ants will not attack teak wood; and hence that description of timber is most generally employed, in the roofs of buildings. We have, however, abundant proof to the contrary, and to give one or two recent instances, I may mention that the organ loft of St. Mary's Church, built of teak wood, was lately renewed, having been nearly destroyed by white ants; in St. George's Cathedral, also, they some years ago worked their way to the organ, through the teak supports of the gallery, and have lately attacked the sounding board of the pulpit.

In many parts of this Presidency, it is extremely difficult to procure teak timber, except at a ruinous expense in land carriage; and in consequence, a very unsubstantial description of roof is employed in private dwellings; and in public buildings, either the expense is incurred, of procuring teak timber at whatever cost, or arches of masonry (almost as expensive) are substituted! True, the latter last a very long time, but, the expense being in proportion to the span of the arch, the accommodation is much cramped, to keep the cost within moderate bounds.

It is extraordinary, that these disadvantages and difficulties, should not have, long since, led to the more general use of the Syrian roof; a method of construction in which no wood whatever is employed, and which is moreover extremely light and durable.

It is possible that the expense attending its first introduction, attributable to the novelty of the material, may have operated with individuals, to prevent the trial being more generally made: but, as regards public buildings, the same cause can scarcely be assigned; the material being the ordi-

nary potters clay used in making pots and tiles, moulded on the native wheel, and baked or burnt, precisely in the same manner; the difference consisting, solely, in the shape of the cones.

The want of timber is assigned as the original cause of the invention of these roofs, in Palestine and Syria, where they are stated to be in general use. They have been tried in Bengal, and are reported to have answered fully the expectation formed of them; but whether from prejudice, or other cause, they have apparently again fallen into disuse.

These roofs, it is believed, are never quite flat, but are formed into arches of every curve; and from their construction must be capable of resisting very great pressure; they are formed of hollow cones of pottery, about 10 inches long, the broader extremity, which is closed, being about 3 inches in diameter, and the narrower, which is open, between 2 and 3, but they may probably vary, according to the span of the roof intended to be built; they are placed by the side of each other, the interstices being filled with mortar; they are found to leak with the first rains and crack slightly, but a coat of oil is applied over the surface, which is afterwards found to render the roof impervious; it is probable that a course of flat tiles, with a plastering of chunam, would answer the purpose in India.

I have been given to understand that the Syrian roof has been successfully constructed at Bangalore, a station where the destruction of every kind of wood by white ants is felt as a most serious evil; should any of your correspondents be enabled to furnish you with particulars, as regard section of the roof, form and dimensions of the cones, and the cost of making them, I have no doubt the information will prove both interesting and useful.

Adverting to the ravages of white ants, it may be useful to mention that the Naptha, or Petrolium, produced in abundance on the Tenasserim Coast, and to be purchased in the bazars of Madras, under the denomination of earth oil, or *munnoo tylum*, is an effectual remedy; it may be used as a paint, alone, or mixed with common tar; or mixed with chunam as a plaster.

MADRAS, *March* 1836. M.

VI.—*A glance at the Banaganpilly Jaghire, taken while passing through that territory in March* 1836.—*By* T. J. NEWBOLD, A. D. C. *to Brigadier General* WILSON, C. B.

Topography.—The Jaghire of Banaganpilly lies between 15° and 16° north latitude, and is situated nearly centrically in the Balaghaut Ceded Districts.

It is bounded, on the north and on the north-east by the territory of His Highness the Nuwab of Kurnúl, on the west by the talúk of Punchapollam, on the south and south-east by the talúk of Koilkúntla.

Its extreme length north and south is about 30 miles, and extreme breadth east and west about 26.

The eastern and southern parts of the Jaghire consist generally of a fertile plain watered by rivulets, taking a south easterly course, and producing large crops of cotton and various kinds of dry grain. The plain is bounded on its western and northern limits by detached ridges of hills, which, running down from Kurnúl, take a south easterly direction by Gooty, Cuddapah and Tripati, and terminate near the eastern coast at Naggery.

A bandy road, connecting the trade of the Ceded Districts with that of Masulipatam, Nellore, Guntoor, &c. by the direct route of the Nundi Cunnama ghaut, passes through the centre of the Jaghire: over the ghaut itself the road is impracticable for bandies, consequently the heavier articles are constrained to go by the circuitous route of Cuddapah and the Yeddadogoo pass. The lighter goods pass over direct on carriage bullocks.

All the natives, with whom I conversed, agreed that the trade would be much increased were the pass opened for bandies: from what I saw of it, I should say this might be done at no very great expence.

Geology.—The plain of Banaganpilly is the western extremity of that wide flat tract, that extends, from the foot of the Nulla Mulla hills, to the range alluded to above.

Note.—The information, here adduced, has, for the most part been obtained on the spot, combined with the result of personal observation.

These ranges are of the clay slate and sand stone formation—the plain itself is mostly covered with the *reygur*, or black cotton ground; in some parts with the alluvium of the neighbouring hills, not unfrequently intermixed with calcareous matter, arising probably from the decomposition of the kankars, which are found strewn in various proportions over its surface. Near the foot of the Nulla Mullas are found nodoles of iron ore, but nearer Banaganpilly these disappear, and their place is supplied by fragments and blocks of variously coloured lime-stone—dark blue predominating.

The streams in this neighbourhood generally flow over beds of this substance.

About ½ a mile to the westward of Banaganpilly, lies the low range of hills, in which the diamond mines are situated; to which I shall have occasion to advert presently.

Division into 2 Pergunnahs. (*a*)—During the Mogul administration the Jaghire was divided into two Pergunnahs, viz. those of Banaganpilly and Chinchimulla—the former comprising 42 and the latter 21 villages.

The principal places are Banaganpilly, Chinchimulla, Nundawarum and Tungatoor.

Population.—The total of population is said to amount to about 40,000, but this cannot be relied on.

It is chiefly Hindu, though there are many Mussulmans, particularly at the principal town.

Revenue.—The revenue, it is said, used to average about a lac and twenty-nine thousand rupees annually. It is chiefly derived from land rents, duties on produce, manufactures, &c. toddy contract, and a duty levied on traders.

Products.—The Jaghire produces a large quantity of dry grain, principally *juari*, cotton and a small proportion of rice; *arundi* and other oils, ghee, tamarinds and toddy. In some parts culinary salt is produced.

At Banaganpilly a variety of cotton cloths are manufactured and dyed. They are chiefly adapted for mussulman

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(*a*) Some say there are 3 Pergunnahs, and that 19 out of the 63 villages are dependancies on the 44 principal ones.

wear; and by far the larger proportion finds its way to the Hyderabad market.

The diamonds produced here are cut and set at the town of Banaganpilly, and used to form an article of trade.

Town and Fort of Banaganpilly.—The town of Banaganpilly lies in the plain, near the entrance to a broad defile, formed by the branching off of two parallel ranges of low hills; one taking a north easterly direction, the other a little south of east. The town is divided by a stream of clear water, called the Zurairoo, into two parts; which are again sub-divided as follows: Condapettah and Suntapettah on the right bank, Kungrazpettah and Kusbahpettah on the left. The buildings generally have an ancient appearance.

The fort is also situated on the left bank. From the cursory glance I had of it, it appears to be little better than the ordinary village forts scattered over the Ceded Districts—and apparently loosely built of limestone cemented with mud. Its round bastions are connected by curtains, pierced with loop holes for matchlocks.

The entrance is from the north. Round the whole runs a ditch now nearly dry: the bottom partly cultivated and partly choked up with rank vegetation. The walls enclose the Nuwab's zenaneh, his residence and those of the retainers attached to his person. In the pettah at the northern side of the fort are some strong and defensible houses of stone.

Our road lay along the southern and western faces of the fort, on our right the fort ditch, and on our left the Zurairoo, which we crossed to some good encamping ground, in a tamarind tope on its right bank.

Population.—The town of Banaganpilly is said to contain about 12,000 houses—700 of Hindus, the remainder occupied by Mahomedans.

Allowing each house to average five inmates, this will give a population of 6,000 souls. Two or three months ago, subsequent to the Company's resumption of the Jaghire, a body of about 700 Puttans, formerly in the pay of the Nuwab, left the place for Hyderabad; where, it is currently reported,

they have been taken into the Nizam's service by Chundoo Lal.

Diamond Mines.—The diamond mines are situated in and near a low range of hills, about ½ a mile from the town. The matrix of the gems, agreeably to the statements of Dr. Heyne and Voysey, regarding diamonds produced in the South of India, is the sandstone breccia of the clay-slate formation. This I found also to hold good with regard to the alluvium found at the base of the Cuddapah hills washed by the Pennaur, on a recent visit to the diamond mines near Chinnoor and Condapettah, in the Cuddapah division.

The process of mining is simply digging out the gravel, breaking up the larger pieces of the breccia, washing and sifting the fragments, and spreading them out on the ground. The diamonds are easily detected by the practised eye of the native. I observed that many of the old heaps of rubbish had been recently sifted and re-examined; not, I am told, from the opinion that the diamond is always growing, and that the chips and small pieces rejected by former searchers, actually increase in size, and in process of time become large diamonds, as has been supposed by some; but from sheer laziness to dig fresh pits, and from its being found that stones of an inferior size and water have frequently eluded the search of former miners.

I do not learn that any stones of a greater value than 3 or 400 rupees have ever been discovered here; the specimens shewn me by the diamond merchants on the spot were certainly extremely poor; but from the shortness of my stay, the duplicity and secrecy maintained by natives in matters of this sort, it would be wrong perhaps to decide that better means scientifically employed in these diamond districts would not produce better results, than has hitherto been the case.

Since the resumption of the Jaghire, mining has been discontinued.

Besides Banaganpilly, the diamond is found, according to Hamilton, at Lamdoor and Pinchetgapadoor, in the talúk next to Chinnoor.

It is also found at Moonimuddagoo, in the talúk of Punchapaulum; at Ovalumpully and Condapettah in the Chinnoor talúk—at Ramulacottah in the Kurnúl territory, and formerly at Wudjrakarure in the Gooty division. The Ramulacottah mines are the most celebrated. These places partly furnished the diamonds, for which Golconda has been so greatly famed. (*b*)

Political Sketch.—The Jaghire of Banaganpilly was received by treaty with the Nizam in 1800, together with the rest of the Balaghaut Ceded Districts, but remained under the original Jaghiredar; who, until recently, retained both the management and revenue of the country.

In 1832, tempted by our non-interference with its administration, and the state of misrule into which it had been thrown by the culpable extravagance and mismanagement of the present chief, Hussain Ali Khan, the Nizam made an insidious attempt to annex the Jaghire to his own possessions, but this intention was totally frustrated by the vigorous interference of Government.

At present the country is still in a very unsettled state.

Hussain Ali Khan's expensive habits have involved him in debt to a very large amount. His creditors are principally usurious Gossayns and Hyderabad Pathan sirdars, formerly in his pay. These men have lately returned to Hyderabad. To satisfy their importunate claims numerous villages of the Jaghire have been made over to them, and from the griping extortion and tyranny practised by these lawless mercenaries in exacting the revenue, the agricultural classes have been reduced to great distress, and are anxiously expecting some change for the better.

I am assured that the news of the Government's intention of assuming the control over the Jaghire towards the close of

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(*b*) A few geological specimens of the general formation of the country, also of the matrix in which the diamond is found imbedded, both from Banaganpilly and Chinnoor, together with one or two gems of the most common description (rough from the mine) found at the former place, are presented for the Society's acceptance. I was unable to procure any at Chinnoor, as the miners had only just commenced operations.

1835, was hailed by these poor people with unaffected joy. Indeed had the Nizam even offered them his protection, there is but little doubt that they would have gladly preferred it to the oppression of these needy soldiers and avaricious Gossayns. Some villages have been assigned over, as a subsistence, to the numerous illegitimate offspring of the late chief, Ghulam Ali Khan; and to others of the family, particularly to Rownuk Ali Khan, cousin to the present chief, and now in the Nizam's service as a sirdar of horse.

Hussain Ali Khan is said to be a man of great good nature, which is not unfrequently allied to extreme inaptitude for business, thoughtlessness and extravagance; all of which have been fully manifested by his conduct. His wife the Begum is looked upon as a superior woman, possessing much influence, when she chooses to exert it, over her husband. Hussain Ali Khan has no male issue: he succeeded his father Ghulam Ali Khan about 18 years ago.

Futteh Ali Khan his younger brother, is looked upon as the next heir. This nobleman has two sons; one a lad about 10 years old, said to have been adopted by his uncle.

Banaganpilly has always maintained a close connexion with the Court of Hyderabad, and also, from its proximity, with that of Kurnul.

VII.—*Prop on an inclined Plane.*

To the Editor of the Madras Journal of Science and Literature.

Sir,

Having accidentally met with your Journal for October 1835, and fancying myself a bit of a Mathematician, my eye was eagerly caught by the lines and letters, page 336 and 337, and I looked for a feast.

I must say, Mr. Editor, I was disappointed to find, in the second figure, so many lines and letters quite unnoticed in the solution of the problem, and still more to find the line A C not in the figure at all. It makes sad confusion, and as it is to prove that the vertical pressure of a body is *not* best supported by a vertical prop, contrary to my notion of the matter, I should have been very glad to see the solution some-

what more clearly made out. Perhaps "A MINER" will favour me (and I think many of your Subscribers will thank him) by revising his paper. I must touch upon the first solution, because *that* to my reckoning is clear enough to be palpably wrong. When P : W : : B C : A C—if A C and W are constant, P will be greatest when B C is the *greatest*. Suppose, Mr. Editor, we said 2 : 4 : : 6 : 12, if 4 and 12 remain constant, surely 2 and 6 must increase and decrease together as long as the proportion lasts. Else we should perhaps have 1 : 4 : : 7 : 12 ; and that will never do. In fact I should say from the body of this solution it would appear P is greatest when P C comes into the vertical position ; which just suits my fancy, that a vertical pressure is best resisted by a vertical prop.

Your obedient servant,

A WOULD BE MATHEMATICIAN.

To the Editor of the Madras Journal of Science and Literature.

SIR,

I beg to return you my thanks for the early perusal of a letter, signed " *A would-be Mathematician,*" containing strictures on the two problems regarding the best position of a prop on an inclined plane, which I had the honour to send you some time ago. The writer says, " fancying myself a " bit of a Mathematician" &c. &c. " I was disappointed to " find, in the second figure, so many lines and letters quite " unnoticed in the solution of the problem, and still more to " find, the line A C not in the figure, at all." Now A C is not requisite, and had the critic been in reality what he ' fancies' himself to be, or had he read with other motive than to cavil, he must have immediately observed that A C should have been printed A G, and verily the only line unnoticed is P N, which I ' fancied' was inserted in the manuscript sent to you, agreeably to the copy I had received, and from which I did not conceive myself justified to depart. However P N happens to be immaterial ; for whether it be written as the Journal shows it " let *s* and *c* represent the sine and cosine

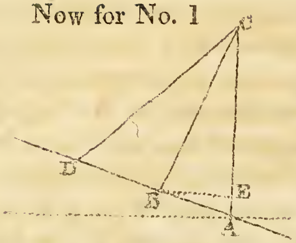
of the angle Q D M=B A M," or as the original before me has it 'Q P N=B A M,' those angles being equal, the result will be the same.

Surely, Mr. Editor, such sweeping censure for typographical errors not affecting the solution, might have been spared by one anxious to promote the circulation of knowledge; and as I affirm, having proved it, that they in no way "make sad confusion," this phrase of the fancied Mathematician's might have been softened. The very fact of the line A C not being drawn in the figure, ought to have led a very superficial reader even, to correct the printer's mistake before alluded to. But I now proceed to notice the "would-be Mathematician's" remarks on Solution the First. But, *èn passànt,* I must observe that, as I gave the avowed author's name, I do not feel myself bound to enter into any controversy for his defence, though I think I may very safely do it on the present occasion. Permit me also to notice in this place, as we are harping on that string, that for our future harmony it would be better if the words "2d solution" came in their proper place, opposite the para. immediately above where they now appear, and "By the Rev. J. Harker" at the close of the sentence immediately preceding—G H should also have been printed *g* H with a little *g*—(though any tyro would have noticed this, and it creates no confusion.)

Having thus corrected the press, I venture to press the following on your notice, in the hope that our friend will correct his hasty reckoning, and that he will prop up the Journal with more proper contributions than the last. I love gentlemanly discussions, am alive to their value, will always yield with acknowledgment to proof and reason; and the "would-be Mathematician" shall find that, though "A Miner," when the 'blow up' is over I am, like a "good crater," open to assault. I shall be glad to hear what he has to say against the convincing proof of No. 2, which

> "Shows by lines and tangents straight
> "What is small and what is great."

Now for No. 1



B E is perpendicular to A C the direction of the weight; and A B perpendicular to B C the direction of the power.

P : W :: B E : A B; but B E : A B :: B C : A C by similar triangles; therefore P : W :: B C : A C and P × A C = W × B C when in equilibrium.

But now, leaving A C and W out of consideration, or constant as it is termed, what will be the result if B C be reduced one half in value or weight? Why its proportion to P, of course, becomes changed to that extent, or P is *relatively* one half greater.

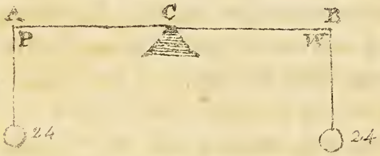
Thus 2 : 4 :: 6 : 12
P : W :: B C : A C } and $2 \times 12 = 4 \times 6$ or $2 = \frac{4 \times 6}{12} = 2$. i,e $2 \propto \frac{4 \times 6}{12}$ when in equilibrium.

But now altering the 6 into 3 (this figure representing B C.)

$2 \propto \frac{4 \times 3}{12} = 1$ that is 2 has now a proportion to 1.

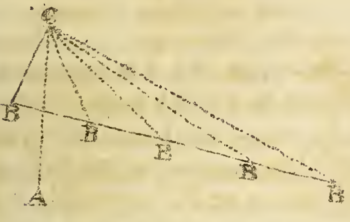
or P is now double in power; and so the more you reduce one side the greater becomes the other (not to *preserve* the 'equilibrium,' mind, for the very reverse is attempted to make the power superior to the weight), and, when B C is a minimum, P becomes a maximum.

But a lever will at once illustrate this; perhaps more familiarly.



The case here is similar, for, according to the property of the lever, P × A C = W × B C as before. Now if we reduce the weight on the right hand side, the left arm falls, and P becomes so much heavier in comparison; or, which has the same effect, if we shorten one arm the other is relatively longer, and so on. The more we reduce B C the greater becomes the energy of P; and its effect is greatest, or a maximum, when B C is shortest, or a minimum.

But, to show that our critic's reasoning is erroneous, with reference to a prop he asserts that "P is *greatest* when B C is *greatest*," and that "P is greatest when B C comes into the vertical position," (or into the direction A C). But now draw all the B Cs as in the annexed figure and carry them on to an extent bordering on infinity. The last is greatest of course (not A C); and where is he? Why with the weight at one end of a long lever *almost* horizontal, and the support at the other; the very weakest position possible.



The fact is, people who discuss this matter, like the "would-be Mathematician," do not recollect that the proportion or equation is, in this problem, purposely altered, and that the only point to determine is how the change on one side will affect the other. To preserve an equilibrium, or the proportion, our friend argued correctly; that is, when B C is greatest, P, or the power, must be increased or made *greatest*, to preserve the equilibrium (the necessity for which we want to avoid), and which is the same as saying when B C is *least*, P, the power *required* to restore the balance, is *least*, (the very thing desired), or, in other terms, when B C is *least*, the original P (without alteration) is *greatest*. It is worthy of remark that the system now adopted at Chatham for Mine Frames, after long discussion and experiment, accords with this theory. The props, in descending galleries, are always placed perpendicular to the inclined plane.

Hoping you will excuse this long dissertation, believe me that you have a sincere friend to the Journal, in

A MINER.

Note.—Is not the point, discussed in the foregoing papers, one involving a question of practice, as much as of pure science?—It seems reasonable to suppose that a *vertical* prop, must be a better support to a direct downward pressure, than a *sloping* prop: but it is quite as reasonable, on the other hand, to suppose that a prop at right angles to the shaft of the mine, would be found the most convenient and sufficiently effectual in practice, and that therefore it may be preferred. It is cer-

VIII.—*Hints regarding the Cape of Good Hope.*

The following letter, with which we have been furnished by an intelligent friend who has recently returned from the Cape of Good Hope, will afford much useful information to such of our readers as may have intentions of visiting that Colony.

" My Dear ——,

" In sending you the following hints, for a family going from Madras to the Cape of Good Hope, I speak feelingly when I say that I have no doubt they may be the means, if attended to, of adding materially to comfort, and of saving Rupees.

" You have been at sea before, but, it may be, not of late years, or with a family ; a few general suggestions may not prove valueless.

" Have all your trunks well corded, to prevent their being rolled over in the hold ; marked with your name, and numbered *in paint* : cards would do, were they not liable to destruction by cockroaches. Let every thing in your cabin, be snugly stowed, lashed and cleated, *before* you take your family on board ; beds made, lamp trimmed, a small hand lanthorn ready to convey a light in, and a couple of candles, ready to burn all night if need be. Do not trust to being in time when you embark to set your cabin to rights, or to the carpenter's assistance in making all fast ! for, in all probability, others will do so too, and, as he cannot help every body, some will go to sea, with cots, trunks, &c. adrift, and you will have a wretched first night of it. A portable kitchen will prove a useful thing, both for that purpose, and as a night lamp ; have a supply of hooks, for lamps, log or

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tainly clear that if a single prop had to support a free weight on the Earth's surface, as a block of stone, it must be placed upright, or in a line tending to the centre of the Earth. And, as this is a plain principle, there seems no good reason why it should not hold good *in principle*, whether the prop has to support a weight on the surface of the Earth, or at some distance below its surface. As said before, there may be good reason for practice differing : the question " which is the best position for the prop" may refer to practice as well as to principle ; if our correspondents continue the discussion it may perhaps be well to bear this distinction in mind.—J. B.

merline for lashings, and hanging clothes or towels upon; a pair of pincers, hammer, nails of sorts, screws, hooks, gimblets and turn screw; a smal llooking glass, clothes brush, one or two small hand swabs, a mop, a hand broom and dust pan. You should have a supply of two dozen of (bottled) good water *in the cabin*, and a reserve (say four to six dozen) in the hold. *On no account* be persuaded to transfer it to the Captain's steward, on the promise that he will supply you when you require it; he, in all probability, has none, except the ship's stock in the hold; and you would find it a poor substitute for your own, when you most needed it. A couple of large Bengal guglets will be useful, to keep your supply of washing water in; one or two of pewter (the round China guglet is very good) standing (or rather hanging) in a grummet of rope or rattan, with the means of hanging them up, are required, to bring your daily supply of fresh water for the cabin from the fore-hold, and two or three common tin pots, for bringing hot water from the galley; one or two China wooden lackered washing basons (for which there will probably be an early call unless your party are all *good sailors*), a clasp knife, cork-screw, a small bucket and rope, a small foot tub, and the means of obtaining a light; but not by the use of acids, or other liquids, lest you endanger the ship. Do not forget comfortable chairs *without* castors; children are best off on board on morrahs or hassocks. You must provide oil for your lamp in stone bottles, and cotton wick; have two lamps, one of thick glass (a globe) for oil, another a sliding shade for candles, and a spare glass for it; tumblers, and, when there are children, strong drinking mugs; take on board some coarse stuff for curtains, with spare brass rings, a few iron rods, and screw eyes for hanging them. You will require for children a good supply of toasted bread, biscuits and ginger-bread in tin cannisters, arrow root, sago, rollong, tea and sugar in stone jars: and you will find Bruce's mulligatawny paste a very grateful addition to broth. Bring all your musquito curtains with you, they will be useful in Cape Town, and are a good protection on board against cockroaches. You may derive not amusement only, from having in your possession three or four skeins of Europe logline,

and a dozen of cod-fish hooks, with a leaden weight of from 8 to 14 lb: an opportunity sometimes offers of good cod-fishing on the bank L'Agullas, in from 35 to 70 fathoms water. So much for equipment.

"A material point for early consideration is, what servants you should take with you from Madras; but it must be a *sine qua non*, that religious prejudices are not to interfere with the performance of such duties as you may require from them, or with the acceptance of such provisions on board as are available; of course the master will seek to render the situation of his native servants as comfortable as possible, if from no other motive, for his own interest, as he would have to send them back if dissatisfied. As to the number for the voyage, you will be best able to estimate, with reference to the number and ages of your party; but by no means bring any men or women of delicate constitution or indolent habits; I mean such as are likely to give up, under the first encounter of the climate, &c. &c. which they will find greatly different from what they have been accustomed to.

"Natives of Madras are sadly "taken aback," on first going to sea; they become sea-sick, heartless, disgusted and useless; but soon recover if taken care of. A well devil'd biscuit, or bowl of hot pepper-water, or mulligatawny, sets them up famously; and if they find that you have provided for their comfort, their good humour will in all probability return, and you have willing and useful attendants; but to effect this, you must attend to some of their comforts hereafter noticed. A good active Ayah, or cloth woman, who speaks English well, will be found a most valuable servant, if not a fine lady, as all the native female servants at the Cape are, who require high wages, and will do little work, in the service of temporary residents, particularly "Hindoos!" who appear to be considered on all sides "fair game," (thanks to one or two Bahaudars, who gave out that the cost of a purchase should determine its quality). They (the Hindoos) are charged with having spoiled the market, but I think without sufficient grounds, for, on arrival at the Cape, if dependent on the place for servants, an Indian requires their services immediately, and is obliged to submit to imposition (for, except he has friends,

there nobody will assist him) at least at first; and he may consider himself extremely fortunate if, once having been obliged to pay high, he can subsequently come down to a reduced scale of wages.

"I am addressing myself to those whose purses have a bottom to them! and therefore assume, that, on the score of economy and comfort, a family will endeavour to get a house of their own as early as possible. If such are your objects, the country, in my estimation, is preferable; and you may obtain a capital house and grounds, on moderate terms, for a year or 18 months certain (about 100 dollars a month). If you wish to be gay, my hints will not suit your purpose. For such an object bring an active plain cook with you (it is difficult to get one at the Cape on reasonable terms, and they are quite unmanageable*), who understands marketing, and is not likely to submit (long) to imposition. He is perhaps the person least likely to be subject to it, after becoming acquainted with the value of dollars, shillings, pence, half-pence, doublegees and stivers; that is in Cape Town, the competition in the market being sufficient security. An active hard working matey, or a lascar willing to turn his hand to any thing, would be a capital stand by; but bring none who are given to tippling; temptation, opportunity and example are abundant. A tailor, combining any other useful calling as dressing boy, child's servant, or the like, would be found a treasure; for workwomen are scarce and very expensive; tailors (according to Indian acceptation) are not to be had, and regular tailors are extremely extravagant.

"In taking your passage to the Cape, you will (in general) find youself obliged to pay nearly the price of similar accommodation to England! In such case, you have a right to look for liberal treatment from the captain; you ought not

"* I heard of an instance, from undoubted authority, when a lady expecting a party to dinner, had ordered a certain number of dishes. At the hour named, no dinner was ready, and, after repeated messages, she went herself, and found the monarch of the kitchen, seated with his legs on the dresser and a segar in his mouth, directing the dishing up of about half what had being ordered, and when questioned on the subject, replying very coolly that it was enough for the party!!! For this you have no redress but to part company, and the successor will prob ably do the same.

to be charged any thing extra, for a full proportion of servants; and baggage should be at discretion. If, however, you *must* pay, the rate should never exceed 100 Rupees a head for servants, the captain *providing every thing;* but do not trust to a *general promise verbally given,* that your servants shall be fed! They are under your protection. The captain will desire his steward "to look after them," and *he* will consider a table spoonful or two of ill boiled rice a handsome provision, with some broken meat and biscuit for the day; or the ship's allowance of salt junk, biscuit and grog will be offered! I would however advise an agreement (to be duly entered into by both parties) that coarse rice, chillies and curry materials (usually laid in for public followers), with a supply of saltfish, and a specific quantity of biscuit and water per head, should be allowed daily, and some broken fresh meat, once or oftener in the week, from the cuddy table. Such an arrangement would tend to keep your servants in health and good humour, and would not ruin the skipper! An iron pot, or sauce pan, should be provided for the servants to cook in, and a specific *hour or two stipulated for,* in which they might cook in the galley without being interfered with. Give the native men a 3 or 5 gallons keg to keep water in (with means of slinging it, and advise them to take it on board filled with water) and a strong vessel, such as a pewter guglet or closed tub, in which they may receive and carry their allowance of water from the hold. Their berth should be distinctly allotted, and their trunks deposited and cleated down there before sailing, or you will have everlasting requisitions for their boxes.

"The women would eat their meals with the cuddy servants, and their allowance of water is generally served out, with that of the family, to the cabin.

"As you will probably be one winter at the Cape, both men and women should have warm clothing; indeed they would in all probability require it on the voyage, if leaving India in the beginning of the year. Flannels to be worn under chintz, &c. are recommended, and a coarse warm wrapper or shawl; worsted stockings *for the voyage,* as they are to be had of that quality in abundance at the Cape, and reasonable in

price. They should all have good stout leather shoes double soled, calculated to be worn with worsted stockings; they cost at the Cape six shillings a pair.

" The men should have at least three coarse flannel bannians each, and three pair of flannel drawers, two pair cloth trowsers, two cloth jackets, one of which should be very warm, say of duffle, and both lined with serge or baize. If they will wear a round jacket and trowsers, you may buy them ready made at the Cape; but if they are to be of their own fashion, have them made in India by all means, for the Cape tailors of any class, will not condescend to work for them. Abundance of good Bengal rice is to be had at the Cape cheap, but the Madras natives do not like it, and your bringing a stock with you, if not obliged to pay an extravagant freight, would be a great indulgence to them, and afford you the means of punishment for neglect of duty, by withholding it.

" If you like curry! bring a large supply of curry powder with you, or make arrangements for having your stock replenished occasionally; what you buy at the Cape has no flavour. Green ginger is not a bad thing to bring or have sent; it keeps well for many weeks, packed in a deal box in dry river sand. Wax candles are better and cheaper at Madras, and, unless you can make up your mind to use tallow, bring a supply, with pillar shades and bed-room candlesticks.

" Few Indians like the Cape wines, but this may be attributed to the trash they taste at the boarding houses; very nice madeira and pontac may be had from the wine merchants; the former from 18 to 25 dollars the half arm, the latter from 22 to 30 dollars. Of European wines, if you prefer them, you had better bring a stock; what you can buy in Cape Town are dear and not fine. You pay a duty on importing wines of 10 per cent. on the value. Good cogniac brandy may be bought there very reasonable. The Cape beer is very pleasant, and (perhaps) in general preferred to Hodgson, and much cheaper; but " Hindoos" very often sigh for the old malt! A brewery has lately been established in Cape Town for draught ale of malt and hop, and promises to answer admirably; the price of a hogshead of it (Collison's) is £ 3-15. Teas will now probably be as good and cheap as in India,

but if you prefer chinchew to lump sugar, bring it with you. Bring your own cot and bedding, well packed and secured against vermin on board, and cots for your children to suit land or sea, for these are very expensive at the Cape. For a child a pair of bullock drawers placed end to end, with a wooden frame rattaned at bottom, and sides to ship on the top, answers admirably. Each trunk should be from 2 feet 1 to 2 feet 6 in length, by 20 or 22 inches in breadth; these will give a cot of 4 feet 4, or 5 feet 2, according to the height of the child. If you have any carpets, or Bengal floor mats, and purpose keeping house at the Cape, bring them, unless you have to pay very high freight; also table gear of all sorts, but do not buy for the purpose, as probably you would do so as cheap at the Cape. Children's shoes are not made, and those from England are very dear, a large stock therefore is desirable, a good proportion of which should be with strong double soles, and calculated for wearing with woolen socks—those for the house may be made of jean or prunella, chilblains being common in winter. Lamb's wool stockings are seldom to be got at the Cape, so, if you have the opportunity, bring a good stock with you; socks of chamois leather are very comfortable under cotton, and a jacket of the same material over your shirt, will save you from the piercing effects of sudden gusts of wind, to which you will be liable at all seasons in Cape Town and its neighbourhood. Bring a carriage with you, or a bandy; the wheels and springs should be in perfect order, as they will meet with rough roads: horses are not driven *en* postilion, so you must mount a dickey. Also bring your harnesses and saddlery, the former should all be provided with breechings. Your conveyances should be well packed to exclude cockroaches on board, or you will fall into the clutches of the coach-makers, who will not spare you when making out your bill. You will now I think start fair, so adieu, till we meet again in Table Bay.

"Arrived in the bay, abundance of excellent boats will come off to the ship, but you must not attempt to land, until the Officer of Health has given his permission; and you must be cautious not to be caught by a south-easter, when it is unpleasant, and often unsafe, to attempt landing. You have only

to consult the boatmen, however, who understand the thing perfectly; only, if they require you to start, do so, and do not trust to your own judgment as regards weather, or delay landing your family, to wait for your baggage. It is better to pay for two trips than run the risk of delay, or a boat heavy laden. But, before landing, I recommend, for your attentive perusal, the annexed extract from the leading article of the "South African Commercial Advertiser," dated 7th April 1833, written in review of part of an article published in the Bengal Hurkaru, and having reference to the particular passage in the margin. I give you this extract, with a view to exonerate myself from being charged with libelling His Majesty's lieges of South Africa, and the authority is, I can assure you, of the best, at least in the estimation of the writer.

"The sum annually spent by "us Indians (in this agreeable "half way House, is computed "at £. 30,000; *one half of which,* "*it may be fairly assumed, we* "*should not spend, if the honesty* "*of the residents were propor-* "*tioned to the liberality of our* "*dealings.*"

"Now, if the case be considered fairly, supposing this "estimate to be correct, we would ask, in what country in "the world would such *liberality* promote honesty? If the "writer can name any town or city in the East or West, where "the misguided stranger is willing to pay two prices, and "where the "Natives," from mere honesty, charge no "more than they could screw out of the most skilful bar- "gain maker among themselves, then we will admit the "charge as a true bill against the Cape. But if no place can "be found where such a quaker-like practice prevails, the "writer must admit that he has laid against the Cape, in "particular, a charge that holds against human nature uni- "versally. If a buyer throws himself upon the "*liberality*" "of the seller, and thereby constitutes him for the time "his agent, to cheat him is abominable, but then he owes "the seller, a salary or per centage for his new office, and "when the ticklish nature of the trust is considered, in which "conscience and custom are so directly opposed to each "other, the allowance should be pretty "*liberal.*"

"Every body knows, that men when making a money

" bargain, are, for the instant, in a state of war. The very " opening of the business is a declaration of hostilities, and " though habit itself has a conscience, and to go beyond " certain bounds on either side, whether of selfishness or " liberality, is inconsistent with a trading reputation, yet " there is a wide scope for opinion respecting the highest " and the lowest price of articles. If the price of any arti- " cle rises, the shopkeeper is not bound to continue selling " at the old rate, because, should prices on the other hand " fall, the purchaser is not bound to pay the same price as " before, till the stock on hand is exhausted. The univer- " sal rule for the shop as well as for the counting house is " 'to buy as cheap and sell as dear as posible.' This all " men can understand and all men can, or should be able " to, practise, for there is no other principle on which trade " can be carried on.

" The opinion that Indians are cheated by a combinati- " on of natives against them, is we think untenable. There " is no corporation of trades or professions at the Cape. " But the same causes will produce the same effects in all " the shops. If every Indian is green, every shopkeeper " will find it easy and safe to squeeze him. Even nettles in " that state may be handled with impunity. Even the " scrupulous shopkeeper will take, not a cheating but, the " highest price from him. The native may honestly claim " the article at the lowest price, because he has spent time, " which is value, in acquiring that knowledge which the " Indian wants. Is it desirable that ignorance should reap " the fruit of knowledge ? ! ! !"

"Now, friend Mull, having perused this document, you know how you stand : you are, for the time being, that is whenever your hand is destined to visit your pocket for the purpose of drawing therefrom coin, much or little, in "a state of war with the natives." You are to avoid being considered "green" and a legitimate subject for "squeezing." You have no right to expect that any thing will be sold to you at the lowest price, because you want "knowledge" of what that price is ! As the extract is taken from the Cape oracle let me advise you to forget that, where you come from, the

prices of goods for sale in shops *are the same for all customers!* you are if you have any regard for your own interest to understand, that the sum asked of you is not the real market value of the article, and what you ought to pay for it, but the measure of the party's conscience who makes the demand! Therefore do nothing without making your bargain beforehand! and first for boat hire—you should land your family for six shillings at the highest, if the weather is fine, but, beware, the boatmen will charge separately for every person, not of your family, whom you may invite to land with you, unless you have taken the boat specifically without reference to whom your party may consist of.

You should go on shore, in the first instance, yourself, and secure quarters. The climate admits of your walking, if not a great invalid, but if you require a conveyance, a person from the stables generally comes on board to take instructions; the conveyances are carriages and buggies, and the rates of hire about the same as at Madras.

You must go to the Custom House, and get a permit for landing your baggage, specifying if you can the number of packages you will require; and a separate order, after paying the duties, for liquors and conveyances. These you will deposit with the searchers, or tide-waiters on the wharf, and your boatman (with whom you had better make a bargain for all your work) will procure waggons or coolies to convey your baggage; and their hire is best arranged by bargain, for they will scarcely work for a new comer at the regulated price.

You will do well, with a family, to go to a lodging house for a few days; there are abundance of them—the best are Mrs. Vanschoor's, Mrs. Cambier's and Miss Rabes'. The terms are generally the same per day, but if your party is large, or you propose remaining some time, say beyond a fortnight, you will be able to obtain a reduction. The usual rate is rix dollars 6 per day per head for adults, 3 for a child, and 1 for a servant; I have known it reduced to 5,1, and ½ respectively: this provides lodging, breakfast, dinner and tea, with Cape wine and beer. You may make a very reasonable bargain for board and lodging (at a second rate

boarding-house) by the month: a man and his wife £15 a month, providing their own liquors and firing.

Almost the first person whose services you will require, after landing at the Cape, will be the washerwoman. They are excessively extravagant and bad; not one tenth of your clothes will be washed at all, and you will have to pay from 2*s*. 6*d*. to 3*s*. 6*d*. per dozen pieces, but you have no remedy, and are at their mercy. After the board ship clothes are washed you will hire a woman to wash by the month, the rates are for a single person from 10 dollars upwards, for a family considerably more; I have paid 40 dollars a month, for washing the clothes of my family consisting of my wife and self, 3 children, 3 Indian servants and 2 English girls.

The wages of a housemaid are from 12 to 20 dollars a month with board; they generally work at the needle, but are fond of idling and require much looking after. Your Indian servants should as soon as possible make themselves acquainted with the nature of the current money, and bazar rates; till when, they will most certainly be imposed upon. The bazar currency, sovereigns, half crowns, shillings, six pences, penny pieces, half-pennies, farthings, rix dollars (1*s*.6*d*.) shillings, ($2\frac{1}{4}d.$) stivers (6 to a shilling) and doublegees ($\frac{3}{4}d.$ each.) Beef of excellent quality from 2*d*. to 3*d*. per lb., mutton 2*d*., fresh butter 2*s*. in summer, and from that to 3*s*. per lb. in winter, good salt butter 8*d*. and 9*d*., fish very cheap and good; vegetables and fruit abundant and cheap in the season; bread good and about the same price as at Madras, milk 3*d*. a bottle, but it is often a little sky blue, and the bottle is barely an honest pint.

The Cape summer season is from the beginning of October to April, during which the residents are generally out of town; you may at this season get a house or lodgings in Cape Town at a moderate rent, and a country residence is expensive. The case is *vice versa* with the change of season. If you want quiet and fine air, the country is the place throughout the year; if gaiety is your object, you must follow the fashion, and return to town for the winter. There are some very comfortable bungalows at Wynberg, eight miles

from Cape Town; supplies abundant and good, and the country tolerably pretty. Sales by auction are held three or four times a week in the streets of Cape Town, at which are sold all sorts of domestic stores, but (it is said) an Indian must avoid bidding in *propriâ personâ*, or the article is immediately run up. If you go into the country you will have to find the means of conveying your stock of supplies from Town; the best way is to treat with some of the labourers in the neighbourhood, who own carts and who occasionally take into the Town for sale, a load of reeds or rushes, &c. If in the country, make early enquiry, and lay in your winter stock of firewood, oats and hay; take care the wood is dry, and look well after the cook who will otherwise ruin you in expenditure in fuel. Oats and hay should be purchased after Christmas when a part of its fresh moisture has gone off; but do not wait beyond January or the price will rise, (coals you must procure from Town) and in taking a groom stipulate that he is to draw water and chop wood for the house. Do not trust to a house being "furnished," as that usually consists of an old table and a few rickety chairs. Some furniture (particularly beds and bedsteads) is very dear, other kinds reasonable. A new table of cedar wood in three pieces, 9 feet long by 5 feet broad, costs from 65 to 75 dollars; a dozen chairs from 90 to 100, and a deduction is made for a good order and ready money. Carpeting from 2 to 4 shillings a yard, the shops are well provided with all sorts of Europe articles, but labor is excessively dear. Military men from India have adopted the fashion, I know not why, of throwing off every part of their military dress at the Cape, thereby incurring a heavy expense in fitting out at the tailor's. Horses are very good at the Cape, but you should take time to select. A good buggy is a pleasant conveyance out of Town, but scarcely sufficient for the winter. The coachmen drive well, but their wages are very high (30 to 40 dollars a month and food); such a man ought to take care of your carriage and horses and be otherwise useful, as chopping firewood, going to market and errands. If you have more horses than three, you will require a boy as an

assistant at about 8 dollars a month; unless you require him to ride with you, when you would want a more regular groom, who would receive about 20 dollars a month.

Your best means of remitting funds (for Rupees or drawing on India is ruinous) is to bring Ceylon, Mauritius or Navy Bills on England, which you may generally sell at a premium. Sovereigns and all English silver money, are current at the Cape. The Madras Rupee is worth no more than 1*s.* 6*d.*

The houses of Agency are extremely polite, and will receive your bills, allowing you to draw against them; this is a very desirable arrangement if you go into the interior: or you may pay them into the discount Bank, which will answer your draughts.

As a valuable factotum and a worthy person, let me recommend you to make early acquaintance with Mrs. Saunders, confectioner in the Here Gracht, who will gladly execute all your little commissions in Town, and has some remains of a conscience.

The household expences of a small family (consisting of a couple and one child) may be thus enumerated.

Accommodation in a boarding-house for 6 months certain, 300 rix dollars, washing and personal servants extra.

Accommodation in separate quarters.

Rent of a small unfurnished house, 80 dollars.

Do. of apartments furnished 100 dollars..

Do. of a family house do. 250 do.

Average ordinary Expences.

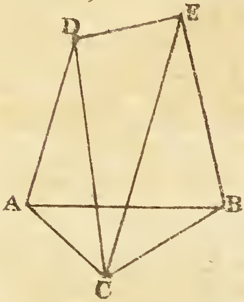
	Dollars.
Cook 25, house boy 15	40
Butcher's bill 40, baker's 25	65
Milk 15, wood 20, salts 6	41
Coffee and tea 10, vegetables 10	20
Sugar, candles, oil	20
Washing 30, house 30, groom 30	90
Fruit, coals, &c. 16, wine &c. 30	46
Total	402

Table of Weather, kept beyond the limits of Cape Town.

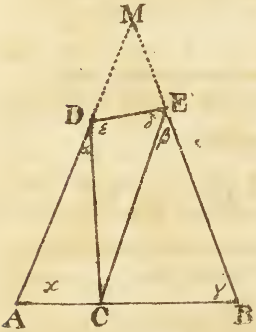
	In Doors at 8 a. m.			
	Thermometer.			
	Highest range.	Lowest range.	Mean range of Month.	
May.	64	56	$63\frac{6}{31}$	Generally fine—4 days rainy, 1 stormy & do.
June.	64	53	$58\ \frac{8}{6}$	Generally fine—6 days rain, 4 days stormy; wind southerly, 1 of them stormy with rain.
July.	62	51	$55\frac{19}{31}$	Generally fine—6 days rain, 3 days stormy with rain.
August. ..	60	53	$55\frac{6}{11}$	Nine days rain, 9 days cloudy.
September	63	55	$56\ \frac{2}{7}$	Generally fine—6 days rain, 3d, 4th and 5th of the month stormy, with wind from south easterly.
October...	65	54	$58\frac{25}{29}$	Generally fine—2 days rain and 2 days stormy, on one of them wind westerly.
November.	69	55	$62\frac{12}{30}$	Generally fine—1st, 11th, 15th, 19th—cloudy 16th, 17th, 18th, stormy wind N. W.
December.	71	62	64.	Generally fine—a few days light rain, wind westerly.
January...	71	63	$67\frac{4}{81}$	Generally fine—3 days rain, wind S. W. S. E.
February.	76	65	70.	Generally fine—wind S. W. S. Easterly.
March. ..	72	63	$67\frac{20}{30}$	Generally fine—15th, 16th, 17th, 18th, 19th, very boisterous, wind S. W.
April.	67	60	$63\frac{14}{30}$	Generally fine—wind S. E. S. W. till 14th, when it began to run to N. Westerly.
May.	64	56	60.	Generally fine—5 days rain, wind N. W. W.
June.	63	54	$59\frac{14}{30}$	Generally fine—5 days rain, W. N. W.
July.	60	52	$56\frac{5}{51}$	Generally fine—5 days rain, snow in the month, wind S. E. and N. W.
August and Sept }	..	..	....	Incomplete.
October...	71	63	67.	Fine wind S. E. with fogs and N. W.

To the Editor of the Madras Journal
of Literature and Science.

SIR,



In Adam's Geometrical and Graphical Essays at page 117, the following problem is given, viz.—The distance of three objects A, B & C, from each other, and the angles A D C, C D E, C E D, C E B being given, to find the sides A D, D C, D E, E C and E B.



The method of construction is there given, and also an indirect method of calculation, but a direct general formula for the solution of the problems may be found. To simplify the calculation, let the three points A C B be conceived in a straight line, and producing the lines B E and A D to M.

the angle $M = \alpha + \beta + \delta + \epsilon - 180^\circ$, and calling the angles $ABE = y$ and $BAD = x$ then

$$x + y = 180^\circ - M = 360^\circ - (\alpha + \beta + \delta + \epsilon) \text{ then}$$

in the triangle C B E we have $CE = CB \times \frac{\sin y}{\sin \beta}$

and in the triangle D C E we have

$$ED = \frac{CE. \sin(\epsilon + \delta)}{\sin \epsilon} = \frac{CB. \sin y \sin(\epsilon + \delta)}{\sin \beta \sin \epsilon}$$

In the triangle C A D we have $DC = \frac{AC. \sin x}{\sin \alpha}$

and in the triangle D C E we have

$$ED = \frac{DC. \sin(\epsilon + \delta)}{\sin \delta} = \frac{AC. \sin x \sin(\epsilon + \delta)}{\sin \alpha \sin \delta}$$

and equating the two values of E D there results

$$\frac{CB. \sin \alpha \sin \delta}{AC. \sin \beta \sin \epsilon} = \frac{\sin x}{\sin y} \text{ whence}$$

$$\frac{CB.\sin\alpha.\sin\delta + AC.\sin\beta.\sin\epsilon}{CB.\sin\alpha.\sin\delta - AC.\sin\beta.\sin\epsilon} = \frac{\sin x + \sin y}{\sin x - \sin y} = \frac{\text{tang}\,\frac{1}{2}(x+y)}{\text{tang}\,\frac{1}{2}(x \backsim y)}$$

and taking tang $\theta = \frac{CB.\sin\alpha\sin\epsilon}{AC.\sin\beta\sin\delta}$ we have

$$\text{tang}\,\tfrac{1}{2}(x - y) = \text{tang}\,\tfrac{1}{2}(x + y).\,\text{tang}\,(\theta - 45^{\circ})$$

by which the value of x and y are found, and therein the values of any of the required quantities.

Yours obediently,

C.

X.—At a General Meeting of the Madras Literary Society and Auxiliary of the Royal Asiatic Society, held at the College, on Saturday, the 30th January, 1836.

PRESENT.

The Honourable *Sir* ROBERT COMYN, President, *in the Chair*.

The Honourable WILLIAM OLIVER, Esq. Vice President.

The Venerable Archdeacon H. HARPER, A. M.

J. ANNESLEY, Esq.
R. COLE, Esq.
Captain KEIGHLY.
W. LAVIE, Esq.
J. OUCHTERLONY, Esq. and
Revd. F. SPRING, A. M.

The meeting having been opened by the Honourable the President, the Revd. Mr. Spring, for the Secretary, laid before them a statement of the funds of the Society, in both its branches.

The following donations having been made to the Society since the last annual general meeting, the thanks of the meeting were unanimously voted to the donors.

FOR THE LIBRARY.

3 Copies of Koros's Tibetan Dictionary and Grammar .... Supreme Government of India.

Essays on Beriberi and Rheumatism, by J. G. Malcolmson, Esq......................... Madras Medical Board.

Result of the Madras Astronomical Observations, for 1832 and 1833.................. Madras Government.

Wight's Contributions to the Botany of India.. The Author.

Transactions of the Royal Asiatic Society, volume 3d, part 3d...................... Royal Asiatic Society.

Ram Raz's Hindu Architecture.............. Do.

Evlya's Travels in Europe, Asia and Africa... Do.

Sangermano's Burmese Empire.............. Do.

Travels of Macarius—part V................ Do.

Journal of the Royal Asiatic Society,—the three first Nos.......................... Do.

Report of the Oriental Translation Fund........	Royal Asiatic Society.
Alfiyya ou la Quintessence de la Grammaire Arabe—par le B. S. de Sacy	Do.
Les Œuvres de Walli—Publiées en Hindoustani—par M. Garcin de Tassy	Mons. G. De Tassy.
Notice sur les Fetes Populaires des Hindous par M. G. De Tassy	Mons. G. De Tassy.
Two copies of the Index to the Asiatic Researches	Bengal Asiatic Society.
The Cape of Good Hope Literary Gazette 9 Nos. for 1835	Presented thro' G. Lys Esq. from the Literary Society of the Cape.
Two Catalogues of books in the South African Public Library	Do.
A Supplement to do...............................	Do.
Report of the first anniversary meeting of the friends of the Popular Library, Cape Town	Do.
Jervis's Essay on the Primitive Universal Standard of Weights and Measures	The Author.
Rask's Samlede Alfhandlinger, 6 Copies	Presented thro' Archdeacon Robinson, from the University of Copenhagen.
Nouvelles Researches sur l'inscription en lettres Sacrèes du Monument De Rossette..	Do.
Vejledning til Akra Sproget—af Prof. R. Rask.	Do.
Solemna Scholastica ad Celebrandum	Do.
Singalesisk Skriftœre af Prof. R. Rask	Do.
Annual Report of the Royal Society of Northern Antiquities at Copenhagen........	Do.
Nordift Zidsftrift for Oldtyndighed..........	Do.
Oriental Historical Manuscripts	Reverend W. Taylor.

The following books, in the Chinese character, were presented by Lieutenant Newbold, in the name of the Rev. Mr. Evans, of the Anglo-Chinese College at Malacca, as specimens of the produce of the Chinese Press of that Institution.

Holy Scriptures in the Chinese language, 21 volumes	Lieutenant Newbold—in the name of the Rev. Mr. Evans.
Scripture Proof—in do. 3 vols	Do.
History of Këa-kus—Chinese emperor 6 vols..	Do.
Family Instructor—4 vols	Do.
Chinese translations of religious works 41 vols.	Do.

Malayan translation of the Bible printed at Harlem .... Lieutenant Newbold—in the name of the Rev. Mr. Hughes.

Do. Do. Do. printed at Serampore Do.

The New Testament in Malay .... Do.

The Gospels and Acts in do................. Do.

Twenty-six pamphlets—translations of religious works, in Malay .... Do.

FOR THE MUSEUM.

A bow and four arrows taken from one of the rebels of the Kimedy country........... W. Gilchrist, Esq.

A collection of Geological specimens, chiefly from the Northern parts of India, being duplicates from the Bengal Society's Museum, presented through Dr. Benza, by .... The Asiatic Society of Bengal.

A series of Mineral specimens, one hundred and four in number, illustrative of the Geology of the Neilgherry Hills, by ...Dr. Benza.

These specimens illustrate the very able and interesting paper by Dr. Benza, on the Geology of the Neilgherries, contained in the *Bengal Journal of Literature and Science*, for August 1835. It is to be regretted, however, that the specimens presented to the Madras Museum, are not numbered according to the references contained in that paper; a classification which would very much enhance their value, in the eyes of the geological student, who may hereafter wish to refer to them. A member of the society having engaged, in communication with Dr. Benza, to arrange the specimens in the order in which they are described in the paper above alluded to, there is no doubt but that this desirable end will be attained.*

A collection of Geological specimens from the Northern Circars, by ....Dr. Benza.

The formations in the district whence the above were taken, are described by Dr. Benza in an appendix to the paper cited above.

A number of most beautiful specimens of the Trap formation near Poonah, presented by ....J. G. Malcolmson, Esq.

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* The Neilgherries being located within the limits of *our own province*, we propose hereafter to give an abstract of Dr. Benza's paper, or to transfer it entire to the pages of our Journal. As the Doctor is again on the Hills, perhaps he may have something to add to his former observations.--EDITOR.

These consist of vesicular Trap, or Amygdaloid, of a dull reddish brown colour, containing embedded crystals of fibrous Zeolite, Cubicite, Green Earth, Rock Crystal and Chalcedony.

The following notice, from a paper by Mr. James Bird, in the 3d number of the *Journal of the Royal Asiatic Society*, will afford an idea of the formations whence these specimens are derived.

" The elevated table-land of the Dekkan is exclusively composed of rocks belonging to the floetz-trap formation. The hills which rise on the western ghâts as a base have conical or tabular forms, and are sometimes distributed in long ridges or terraces which run east-north-east.

" At the openings in the hills west of Punah, known by the name of the Ghâts, and which are the passages from the lower land of the Kon-kan into the higher land of the Dekkan, these tabular forms are grand and beautiful. They are generally triangular shaped, and insulated from each other by broad and deep ravines, of which the perpendicular descent cannot be less than twelve or thirteen hundred feet.

" The rock composing these tables is compact basalt of a black colour, in which hornblend predominates.

" About Punah, and further south-eastwards, the rocks are generally amygdaloidal, and become lighter in colour the farther they are removed from the western entrance. This amygdaloid is in no respect different from the toad-stone of extra tropical climates. It shews embedded masses of calcedony, zeolites, and green earth; and in the neighbourhood of water courses, at the depth of five-and-twenty or thirty feet below the surface, contains drusy cavities of crystallized quartz, the appearance of which, in digging wells, indicates that water is near."

A collection of Mineral specimens from various parts of the Peninsula of India, by..	Captain Boileau.
A figure of a Burmese Deity................	Hon. *Sir* R. Palmer.
The sumpitan, or blowpipe, and a quiver of poisoned arrows used by the *Jacoons*, a savage race inhabiting the mountains and forests of the Southern parts of the Malay Peninsula, once the property of one of their Batins or chiefs, by whom they were presented to the donor..................	Lieut. Newbold.
A specimen of the rude cloth worn by them round the loins, made from the fibrous bark of the Terap tree......................	Do.
A hunting basket worn across the shoulders..	Do.
A rude call or whistle used by the Malays....	Do.
A Malayan Buah-raga, or foot-ball..........	Do.
A Malayan spear used by the Malayan chiefs..	Do.

A common Malay kris	Lieut. Newbold.
A common Malay fishing line	Do.
A bow obtained from a native of the Celebes	Do.
A bundle of arrows from do. do	Do.
A Malay sling made of human hair	Do.
Specimen of tin of Salangore	Do.
Specimen of stream ore	Do.
A Chinese Abacus, or calculating board with apparatus for writing	Do.
A Chinese opium pipe	Do.
A packet of upas poison	Do.
A small Cobra di Capello, about $1\frac{1}{2}$ feet long, in the act of swallowing a smaller snake of another species, of which it has effected the deglutition of about one third	Revd. Mr. Spring, in the name of Captain Bernard.

The following gentlemen have been elected members since the last general meeting:—

C. R. Baynes, Esq.
T. Jarrett, Esq.
N. B. Acworth, Esq.
H. Morris, Esq.
A. H. Harris, Esq.

The following vacancies have occurred by death or retirement since the last general meeting.

J. G. Malcolmson, Esq.	gone home.	Captain Lane,	gone home.
Ven. Arch. T. Robinson, A.M.	do.	W. E. Underwood, Esq.	Retired.
W. H. Richards, Esq.	do.	T. H. Davidson, Esq.	do.
Captain Boileau,	do.	Captain Alexander	do.
Colonel Pearse,	do.	C. A. Kerr, Esq.	Dead.

Resolved,—that an early meeting of the Committee of Management be called, for the purpose of taking into consideration the best means of effecting an improvement in the selection of books from England, and the expediency of disposing of any useless works which may now form part of the Library.

The meeting proceed to elect three members for the Committee of Management for the ensuing year, in succession to Lieutenant Colonel Cullen, A. Robertson, Esq. and Captain Rowlandson—when the Venerable Archdeacon H. Harper, A. M. and James Minchin, Esq. were duly elected and Captain Rowlandson re-elected.

The thanks of the meeting were voted to the Honourable the President, for his able conduct in the chair.

Days	Standard Barometer No. 3, by Gilbert.							Standard Therm. by Troughton						
	Sun rise.	10 A. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10 P. M.	Sun rise.	10 A. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10 P. M.
Dec.	Inches													
1	30,132	30,164	30,152	30,130	30,122	30,154	30,150	73,2	77,5	79,0	79,6	77,9	76,0	75
2	,132	,172	,146	,104	,108	,144	,148	76,1	79,3	80,4	79,0	79,5	74,5	77
3	,136	,172	,152	,110	,126	,144	,154	73,7	78,5	79,4	79,5	77,0	76,0	74
4	,156	,180	,164	,146	,150	,174	——	72,0	78,0	79,6	79,2	74,0	76,2	75
5	,162	,210	,180	,150	,144	,174	,185	71,0	78,1	78,8	77,0	75,7	75,8	—
6	,168	——	,182	,146	,154	,174	——	73,0	——	77,2	77,3	76,5	75,6	—
7	,135	,188	,163	——	,124	,150	——	73,5	75,3	75,2	——	74,2	74,3	—
8	,140	,184	,150	,117	,104	,154	——	73,4	79,1	79,8	79,6	77,1	76,3	7
9	,150	,174	,144	,100	,110	,144	,164	73,8	77,2	78,0	78,2	75,9	75,3	7
10	,136	,172	,152	,130	,118	,140	,178	69,9	77,0	79,2	78,9	75,0	74,1	7
11	,158	,193	,172	,150	,134	,166	,180	72,9	75,0	78,6	78,0	77,0	75,9	7
12	,166	,196	,178	,132	,136	,172	,164	69,8	76,3	77,4	78,3	76,4	75,7	7
13	,158	,188	,154	,108	,116	,144	,168	72,3	77,6	78,9	80,0	77,0	76,1	7
14	,136	,160	,144	,116	,118	,138	,160	72,8	78,2	78,0	79,6	76,5	75,0	7
15	,150	,178	,158	,110	,120	,142	,158	71,8	77,0	80,0	80,5	77,5	76,3	—
16	,154	,196	,180	,146	,144	,176	——	73,1	76,0	79,3	79,0	76,7	75,6	—
17	,182	,212	,200	,166	,172	,206	,222	73,3	78,1	77,7	78,0	75,6	73,5	7
18	,208	,220	,188	,162	,168	,194	,200	69,0	76,6	78,4	78,6	78,0	74,9	73
19	,154	,196	,154	,132	,123	,140	,140	68,8	75,3	77,4	78,8	75,2	70,8	6
20	,122	——	,146	,122	,129	,142	,148	69,5	——	76,7	77,2	76,0	72,6	72
21	,136	,196	,180	,140	,140	,150	——	66,9	76,3	77,7	77,9	76,2	73,7	—
22	,141	,186	,158	,116	,128	,140	——	70,7	76,2	77,0	77,7	76,0	75,1	—
23	,154	,228	,180	,156	,162	,178	,182	69,3	78,1	79,0	78,7	77,0	74,8	74
24	,154	,202	,1 8	,134	,124	2	——	69.0	75,7	77,4	78,4	76,1	72,6	—
25	,132	,164	,128	——	,108	,114	,148	70,	74,2	77,0	——	75,1	70,9	0
26	,096	,150	,130	,080	,190	,114	,140	69,0	74,7	76,2	77,5	75,2	72,0	8
27	,134	,188	,156	,132	,128	,134	——	67,4	74,6	77,1	77,4	74,5	70,9	—
28	,138	,182	,152	,112	,104	,132	,128	65,8	73,6	76,4	76,9	73,2	69,2	7
29	,122	,158	,128	,102	,096	,116	——	63,6	73,4	76,5	77,3	72,2	69,5	—
30	,096	,160	,122	,080	,102	,136	,144	66,9	75,2	77,2	76,9	75,5	73,2	6
31	,150	,178	,160	,116	,120	,138	,142	67,3	74,0	76,3	76,4	75.7	73,9	8
Mean.	30,145	30.184	30,159	30,126	30,130	30,151	30,162	70,6	76.4	78.0	78,3	76,0	74,1	5

	Dep. of wet bulb Therm.							Rain.		Evaporation.	Wind.	Remarks.
	Sun rise.	10 A. M.	Noon.	4 P. M.	Sun set.	8 P. M.	10 P. M.	Sun rise	Sun set.			
1	0,2	0,6	2,0	2,8	2,2	3,1	2,1	0,056	——	——	N. NE.	
2	0,1	1,5	4,4	[illegible]	[illegible]	2,3	3,6	——	——	1,406	E. NE.	Mostly Cloudy.
3	1,7	5,1	6,4	1,5	0,2	[illegible]	0,7	——	——	——	N. NE.	Mo. cly. day& clr. nt. dew.
4	1,1	6,0	6.6	5,7	1,9	3,9	3,5	——	——	——	N. NE.	Mostly cloudy day & night.
5	1,0	4,3	6,8	5,0	5,4	4,9	—	——	——	——	NE. E.	Mly. clo. day & cr. nt. dew.
6	2,9	—	5,3	5,4	4,0	3,4	—	——	——	——	NE. N.	Cloudy.
7	0,6	3,1	0,7	—	0,2	0,3	—	——	0,992	——	NW. N.	
8	0,1	2,3	1,3	3,3	2,8	2,3	1,8	0,274	0,003	——	N. NE.	
9	1,9	5,3	—	6,4	3,9	4,6	1,7	——	——	1,743	N. NE.	Mly.cly.day & nt. hy. rn.
0	0,4	4,8	6,6	5,9	2,5	1,8	2,4	——	——	——	N, NE.	
1	1,7	1,9	3,6	4,0	3,0	2,7	2,3	——	——	——	N. NE.	Mly.cly. day&clr. ngt dew-
2	0,9	4,0	4,8	5,7	3,5	2,9	3,1	——	——	——	N. NE.	Mostly cloudy day & night.
3	1,3	3,2	3,9	5,4	3,5	[illegible]	1,0	——	——	——	N. NE.	Mly.clr.day.& nt. hy. dew.
4	0,8	2,4	3,5	5,2	2,6	2,5	1,6	——	——	——	N. NE.	Mly. cly. day & clr. nt. do.
5	0,2	1,7	4,5	4,5	2,5	1,4	—	——	——	——	N.	Mly. clr. day & nightt do.
6	0,1	0,3	3,8	3,8	1,9	2,7	—	——	0,208	1,639	NW. N. NE.	Mly. cly. day & nt. & rain.
7	1,5	4,3	5,7	5,0	5,1	3,5	2,8	0,038	——	——	E N.	Mly. cly. day & clr. night.
8	1,0	5,8	6,6	6,6	1,5	—	3,3	——	——	——	NE	
9	1,9	4,7	7,4	7,6	4,6	0,6	0,3	——	——	——	NE. N.	
0	1,7	—	6,7	6,6	4,8	2,6	3,2	——	——	——	N. NE.	
1	0,9	6,0	6,2	5,4	4,1	4,1	—	——	——	——	NE. N.	Mly. clr.day & nt. dew.
2	1,0	4,3	4,7	6,8	6,0	4,2	—	——	——	——	N. NE.	
3	1,4	6,8	7,0	6,9	4,5	[illegible]	1,4	——	——	1,635	NE. E.	
4	1,5	3,8	6,8	7,6	3,8	2,6	—	——	——	——	NE. N.	
5	3,3	2,7	7,0	—	5,6	2,4	2,0	——	——	——	N. NE.	Clear day & nt. hy. dew.
6	2,8	5,0	6,2	6,5	5,0	3,2	1,8	——	——	——	N. E. SE.	
7	1,9	4,6	6,9	5,4	4,5	2,9	—	——	——	——	NE N.	Mly. clr. day & night do.
8	1,8	4,1	6,4	10,5	9,0	5,1	4,2	——	——	——	N. NW. NE.	Mly.cly. d. & clr. nt.hy. do.
9	3,1	9,4	10,0	9,3	3,2	1,6	—	——	——	——	NW. NE.	Mly. clr. day & cly. ngt.
0	1,0	8,8	9,2	6,9	5,5	4,2	3,6	——	——	0,938	N. NE.	
1	1,9	3,0	4,7	5,4	5,7	5,7	5,8	——	——	——	NE. E.	Mly. flying clds. day & nt.
	[illegible]	4,1	5,5	5,6	3,7	3,0	2,5					

Days.	Standard Barometer No. 3, by Gilbert.							Standard Therm. by Troughton						
	Sun rise	10 P. M.	Noon.	2 P. M	Sun set.	8 P. M.	10 P. M.	Sun rise.	10 A. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10
Jan.	Inches							°						
1	30,134	30,144						62.4	75.0					
2	30,100	,136	30.086	30.072	30.078	30.112	30.126	60.9	75.4	77.6	78.0	76.7	72.7	71
3	,106	——	.122	.094	.074	.108	.114	63.0	——	78.3	78.7	76.4	74.0	73
4	,130	,180	.160	.108	.106	.116	.126	65.1	78.2	78.4	79.3	77.0	75.0	74
5	,128	,144	.122	.084	.074	.100	——	63.0	75.2	77.0	77.4	74.9	74.8	—
6	,094	,140	.128	.102	.086	.116	.140	58.6	76.4	78.4	78.5	75.4	74.3	72
7	,126	,176	.154	.110	.110	.130	140	60.0	76.2	78.6	78.7	75.8	72.0	71
8	,110	——	.118	.080	.078	.108	118	69 0	——	78.4	79.3	75.9	71.0	69
9	,120	.152	.144	.100	.104	.128	.150	62.2	72.6	77.0	78.0	76.2	75.2	73
10	,112	——	.142	.108	.102	.120	.132	63.5	——	78.1	79.0	77.0	75.8	75
11	,141	.156	.134	.100	.094	.110	.130	64.8	78.0	79.0	78.7	76.9	76.0	—
12	——	——	——	——	——	——	——	——	——	——	——	——	——	—
13	,091	.126	.110	.090	.100	.114	.118	63.7	77.6	79.3	79.0	76.0	72 8	72
14	,082	.136	.116	.100	.094	.130	.146	61 0	77.8	80.2	80.7	77.0	74.9	73
15	,104	.160	.152	.118	.106	.124	140	66.9	77.0	79.0	79.0	76.0	74.2	75
16	,136	.160	.150	.128	.110	.126	.150	65.9	78.0	78.8	79.8	75.7	74.9	74
17	,146	——	.140	.120	.102	.125	——	61.8	——	77.9	78.0	76.2	75.4	—
18	,146	.200	.182	.140	.146	.168	.190	60.8	76.3	77 0	77.7	75.6	76.8	7
19	,182	.228	.196	.160	.142	.146	.150	63.1	76.3	77.8	78.3	75.2	72.8	76
20	,126	.174	.157	.124	.120	.128	.134	61.1	76.0	77.4	78.3	75.5	74.2	73
21	,146	.194	.154	.128	.150	.150	.154	64.5	76.9	77.8	78.9	76.0	74.2	74
22	,175	.216	.200	.160	.152	.172	——	60.6	75.2	77.3	77.9	75,6	74.3	—
23	,182	.218	.196	.158	.150	.162	.192	60.1	76.2	77.3	77.7	75.8	73.5	73
24	,196	——	.194	.166	.178	.192	.214	61.6	——	77.0	78.0	76.0	74.3	7
25	,188	.252	.214	.172	186	.206	.208	58.5	75.5	77.5	78.0	75 5	74.8	7
26	,204	258	.212	.180	.188	.226	——	61.4	76.9	78.0	78.7	75.9	75.1	—
27	,214	.260	.218	.184	.172	.212	.214	64.5	77.2	78.7	79.0	75.9	75.3	7
28	,14	.282	.250	.200	.198	.224	.252	61.5	77.4	77.8	75,8	76.0	74.8	7
29	,218	.276	.240	.202	.214	.230	.244	61.2	76.7	78.3	78.4	75.9	75.0	7
30	,224	.290	.258	.214	.204	.220	.240	61.3	77.2	78.4	79.0	76.5	75.3	7
31	,246	——	.246	.202	.196	.216	.222	61.0	——	79.3	79.4	77.3	75.0	7
Mean	30,151	30.194	30.169	30.135	30.131	30.152	30.163	62.4	76 5	78.1	78.5	76.0	74 4	7

	Dep. of wet bulb Therm.							Depth of Rain.		Evaporation.	Direction of Wind.	Weather.
	Sun rise.	10 A. M.	Noon	2 P. M.	Sun set.	6 P. M.	10 P. M.	Sun rise.	Sun set.			
1	2,4	5,8	—	—	—	—	—	—	—	—	NE.E.	My. clear day and nt. dew
2	1,9	5,4	5,6	6,0	4,9	2,9	1,7	—	—	—	NE.SE.	Do do do
3	1,5	—	8,6	6,7	5,1	2,	2,7	—	—	—	NE.E.SE.	Do do do
4	2,1	6,5	5,4	6,4	4,1	3,7	2,5	—	—	—	N.NE.E.	My. clr. day & cly. nt. do
5	1,3	4,7	5,0	6,0	4,4	4,8	—	—	—	—	N.NE.	My. cdy. day and night
6	0,2	3,7	7,6	7,5	3,5	3,8	2,2	—	—	1,802	N.NE.	My.clr.day & nt.heavy dew
7	1,6	4,4	6,6	7,9	5,6	2,5	2,1	—	—	—	N.NE.	Do do do
8	2,	—	10,4	11,3	5,3	1,4	,0	—	—	—	N.NE.	Do do do
9	2,4	2,1	5,3	7,2	4,0	4,8	5,2	—	—	—	N.NE.E.	Do do do
10	2,0	—	6,1	6,0	5,0	4,4	4,3	—	—	—	N.NE.	Do do do
11	1,3	4,1	5,8	6,7	5,2	6,0	6,2	—	—	—	NW.N.NE.	Do do do
12	—	—	—	—	—	—	—	—	—	—		
13	—	7,5	9,3	7,0	6,0	3,3	4,5	—	—	1,958	N.NE.	My. clr day & night. do
14	0,2	6,0	12,2	12,7	5,7	4,7	3,3	—	—	—	N.	
15	7,2	6,8	8,7	9,0	7,8	6,9	6,6	—	—	—	N.NE.E.	My. cdy. day and night.
16	7,1	85,5	8,8	10,8	7,4	6,9	6,8	—	—	—	N.NE.E.	Mly. clear. day & night.
17	2,8	—	7,1	7,2	5,6	5,4	—	—	—	—	N.NE.	Mly. cdy day & night
18	0,3	7,1	8,0	8,5	5,6	8,8	3,2	—	—	—	NE	
19	1,6	7,6	7,0	7,5	5,3	3,8	2,7	—	—	—	NE.E.	
20	3,9	4,2	5,4	6,3	5,5	5,0	5,0	—	—	2,312	NE.E.	Mly. clear day & night dew
21	2,3	6,4	6,8	6,7	6,0	4,2	4,0	—	—	—	N.	
22	2,1	5,0	6,7	5,6	5,6	3,3	—	—	—	—	NE.E.	Mly. cdy. day & night
23	2,5	5,9	6,3	6,0	7,8	4,5	4,0	—	—	—	E.NE.	My. clr. day & cdy nt.
24	0,3	—	6,5	6,5	6,1	1,0	3,8	—	—	—	E.NE.	My. cr. day & night dew
25	1,5	4,5	6,3	6,0	3,3	5,9	4,1	—	—	—	NE.	Do do do
26	1,9	4,7	7,7	7,7	6,7	5,9	—	—	—	—	E.NE.	My. cr. day & cly night
27	5,5	6,8	—	7,4	7,7	6,3	7,0	—	—	1,924	E.	
28	2,5	6,5	7,8	5,4	6,7	5,8	4,0	—	—	—	E.NE.	
29	2,2	6,7	8,3	8,1	5,9	5,0	4,0	—	—	—	E.NE.	
39	2,0	5,4	5,9	6,2	6,3	4,8	4,5	—	—	—	E.NE.	My. clr. day & nt. dew
31	0,8	—	7,3	8,6	6,0	4,0	2,9	—	—	—	E NE.	
an.	2,	5,7	7,2	7,4	5,7	4,6	3,9					

Days.	Standard Barometer No. 3, by Gilbert.							Standard Therm. by Troughton.						
	Sun rise.	10 A. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10 P. M.	Sun rise.	10 A. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10. P. M.
Feb.	Inches													
1	30,178	30,246	30,220	30,170	30,142	30,150	30,154	60,9	77,2	79,0	79,5	77,0	72,3	69,0
2	,141	,178	,182	128	,114	,127	,126	60,1	76,0	78,0	79,2	76,5	73,8	69,4
3	,142	,188	,176	,128	,118	,116	,124	62,2	75,0	77,7	78,9	76,9	70,9	67,7
4	,15	,206	,184	,128	,112	,120	,144	60,5	75,3	77,3	78,8	77,0	70,6	68,2
5	,113	,162	,152	,112	,114	,124	,154	61,2	74,8	77,8	78,0	75,9	74,0	70,2
6	,138	,228	,210	,162	,140	,152	,168	61,8	77,0	78,0	79,0	76,4	75,3	74,0
7	,170	,212	, 86	,144	,130	,144	,160	66,0	77,7	79,2	79,4	77,1	76,4	71,6
8	,122	,162	,150	,118	,094	,096	,094	61,9	76,2	78,0	79,0	77,0	73,3	68,3
9	,094	,126	,090	,062	,038	,050	,062	61,2	77,1	78,4	80,8	78,3	76,0	74,9
10	,044	,126	,084	,058	,030	,046	,056	62,9	76,9	79,6	80,8	78,6	76,3	76,2
11	,068	,090	,086	,042	,008	,024	,062	67,0	79,9	81,2	81,7	79,8	78,4	78,2
12	,036	,082	,060	,010	29,998	29,988	,024	72,1	80,0	81,2	81,0	79,4	78,0	77,8
13	,042	,102	,084	,054	30,024	30,042	,058	72,0	81,0	80,8	80,8	80,2	79,8	78,8
14	,088	——	,104	,080	,058	,070	,094	75,0	——	82,2	82,4	81,4	79,8	79,0
15	,072	,100	,080	,038	29,992	,010	,036	72,8	80,9	82,8	82,6	80,9	79,0	78,8
16	,030	,070	,050	,032	,998	,004	,050	70,4	81,3	81,6	81,4	80,2	78,0	77,6
17	,038	,138	,118	,100	30,070	,085	,100	68,8	79,8	81,0	81,2	80,1	79,1	79,0
18	,104	,162	,150	,126	,110	,118	,132	73,1	80,7	82,2	83,4	80,8	79,8	79,7
19	,118	,158	,146	,130	,110	,116	,130	72,5	80,4	82,3	82,7	80,4	79,8	79,0
20	,120	,200	,190	,156	,154	, 58	,174	73,4	80,6	82,4	82,8	80,6	79,8	79,3
21	,160	——	,202	,160	,148	,176	,194	70,7	——	81,3	81,8	80,3	79,5	78,3
22	,152	,212	,188	,140	,144	,156	,190	68,5	79,6	80,3	80,4	78,7	77,9	76,8
23	,140	,218	,204	,174	,118	,180	,204	65,7	78,7	80,0	80,0	79,0	79,0	75,9
24	,136	,224	,208	,166	,102	,164	,200	66,0	78,0	79,7	80,4	78,3	77,9	74,0
25	,130	,214	,200	,174	,150	,186	,196	65,0	77,6	79,4	80,7	78,9	77,5	77,2
26	,132	,218	,194	,158	,140	,156	,164	66,0	77,8	80,4	81,0	79,1	76,1	73,8
27	,102	,154	,140	,106	,110	,094	,094	66,1	77,9	80,4	80,7	79,9	75,9	73,7
28	,062	——	,082	,062	,036	,078	,098	65,8	——	79,5	80,6	79,2	78,5	76,6
29	,040	,108	,094	,082	,058	,070	,076	66,2	78,4	80,3	81,0	78,9	77,5	73,8
Mean.	30,106	30,164	30,145	30,110	30,090	30,104	30,123	66,7	78,3	80,7	80,7	78,8	76,9	75,0

Dep. of wet bulb. Therm.							Rain.				
Sun rise.	10 A. M.	Noon	2 P. M.	Sun set.	8 P. M.	10 P. M.	Sun rise.	Sun set.	Evaporation.	Winds.	Remarks.
0,7	—-	11,0	9,5	9,1	5,9	4,0	——	——	——	N.N.E	
2,7	7,0	8,6	9,5	7,2	5,8	1,4	——	——	——	N.E.E	
4,2	6,8	10,7	10,1	9,5	5,2	3,2	——	——	2,083	S.W.E	Clear day & night dew.
3,7	8,0	12,9	8,7	0,3	5,6	5,2	——	——	——	E.S	
5,2	8,0	11,8	10,2	9,1	7,6	4,5	——	——	——	S.W.	Mostly clear day & night.
5,5	8,9	8,6	10,0	8,1	7,3	6,0	——	——	——	E.S.E.N.E	Mostly clr.day&cldy.night.
4,7	9,7	10,0	10,3	8,8	7,4	5,2	——	——	——	E.S.E.N.E	Mostly clearday&nightdew.
4,5	7,4	8,1	8,5	7,9	5,6	2,8	——	——	——	SE.E.N.E	do. do.
3,3	7,2	8,0	9,0	7,1	4,3	4,9	——	——	——	NE.SE	do. do.
5,7	5,7	7,4	7,2	5,3	4,4	4,2	——	——	,767	SE.S	do. do.
3,5	6,0	6,0	6,5	2,4	0,4	—-	——	——	——	SE.SW.S	Mly.clrdaycldynt.ltg&rain.
3,8	4,0	5,2	5,3	4,9	4,2	4,3	0,316	——	——	S.SW	Mly.flgcldsday&ntltgNE&E
2,3	6,7	5,3	5,1	4,3	4,0	2,8	——	——	——	SW.S.SE	Mly cldyday&clr nightdew
3,3	—-	5,4	5,9	5,0	4,0	3,3	——	——	——	S.SW.SE	Mly. clear day & night dew.
2,9	6,6	7,3	7,9	5,6	4,5	4,6	——	——	——	S SW.SE	do. do.
0,1	5,4	7,6	6,8	9,5	5,3	5,6	——	——	——	S.SW.SE	Clear day and night dew.
3,9	7,9	8,7	8,4	5,3	6,1	5,5	——	——	1,583	SE.S.SW	Mostly cloudy day & night.
4,2	6,7	7,2	10,0	6,1	5,3	—-	——	——	——	SE.E	Mly.clear day & night dew.
4,1	5,9	7,6	8,7	6,4	5,8	5,2	——	——	——	S SE.E	Mly. cl.day & cloudy night
3,1	6,4	8,6	8,3	6,7	6,0	6,0	——	——	——	E.SE.SW	do. do. do.
5,2	—-	9,6	8,9	7,8	7,3	8,3	——	——	——	E SW.SE	Mly. clear day & night dew
3,8	100	0,9	10,9	9,9	9,0	8,5	——	——	——	E.SE.	Clear day and night dew
3,0	8,7	9,3	9,5	9,0	9,3	6,7	——	——	——	SE.S	Cl. day & flying clds at nt.
3,8	7,9	8,7	8,8	7,6	7,0	4,7	——	——	2,035	E.SE	Clear day and night dew
3,2	6,5	8,3	8,4	7,5	6,0	5,9	——	——	——	E.SE	do. do. do.
3,4	6,8	10,3	9,7	7,9	6,0	4,5	——	——	——	SE.S	do. do. do.
3,7	6,9	9,6	7,9	8,7	6,4	4,7	——	——	——	SW.E	do. do. do.
6,0	—-	8,5	8,2	4,7	6,8	6,6	——	——	——	SW.SE.E	do. do. do.
3,8	7,2	11,3	11,3	8,5	5,4	5,4	——	——	——	S.SE.	do. do. do.
3,7	7,1	8,5	8,6	7,2	5,8	4,9					

The instruments with which the foregoing observations have been made, are placed upon a table about 4 feet above the ground in the western verandah of the Honorable Company's Observatory; which is situated in the longitude *5h. 21m. 9s.* E. latitude *13h. 4m. 9s.* N. at about two miles from the sea and about 27 feet above the low water mark.

T. G. TAYLOR,
H. C. Astronomer.

26th March 1836.

MISCELLANEA.

1.—Percussion Caps for Musketry, &c.—We copy the following from a private letter dated in August last, from an intelligent and scientific officer in charge of H. M's Armoury Mills for the manufacture of small arms, swords, &c. situated a few miles north of London on the river Lea :—" We have been bewildered by a multiplicity of inventions, but our original and safe principle of the nipple and cap is working its way gradually and securely to the top, and I have no doubt will eventually succeed. We have offers as low as 1*s*. 10*d*. per thousand for the caps uncharged, as it is proposed that the whole are to be primed with the fulminate by the laboratory at Woolwich. A man at Birmingham has offered a machine by which one boy can prime 50,000 caps per Hour ! ! ! what think you of that !—And I am now in treaty with a Frenchman for a machine, or collection of machines, that is capable of stocking a musket complete at the rate of 600 per day. I have seen one of his stocks with the barrel, lock, brass work, ramrod, &c. let in very neatly.—This if it is brought to bear will cause a re-action in the gun trade. We are now busy arming the Spanish auxiliaries, and are sadly pressed for men."

J. B.

2.—New Iron Mine in Sweden.—Another competitor has started up near Thörshalla, a little town about 90 miles inland from Stockholm. A Mr. Zerthelius is working the ore there after the English manner, and produces better ore than the Dannemöra mines, who have already been obliged to lower their prices 30 per cent. I have written to a friend at Stockholm to send me a specimen of the ore and a sample of the iron, which, if I succeed in procuring, I will find some opportunity of communicating to you.

3.—Drilling holes in Glass.—A common drill, dipped in spirits of turpentine, is said to make quick work in boring through glass, and not to be more blunted than by piercing iron of the same thickness. It is a recent improvement adopted from the French.

4.—Cost of Parliamentary Sanction.—" In round numbers the following are the costs of a few of the late bills as given to me by those who profess to have the means of knowing. The London and Southampton railway bill cost 31,000£, exclusive of the opposition to the great Western.—The Birmingham railway 90,000£.—The London Docks 100,000.—The great Western (railway) it is calculated will fall little short of 150,000£, whether the bill be obtained or not; hence the last bill including the expenses of opposition may be set down at least at 260,000£."—*Mechanics Magazine, August*, 1835.

5.—Analysis of the Nellore Copper Ores; by James Prinsep, Esq. Assay Master at Calcutta.

" Through the kindness of Mr. C. A. Kerr, I have had a further opportunity of examining the produce of the Nellore copper mines, of

which cabinet specimens were presented to the Asiatic Society two years ago*, before the formation of the "*Indian Copper Mining Company*" at Madras, for the purpose of turning to profit the mineral stores of this promising district.

"From a pamphlet published at Madras, we learn that the copper mines in the Nellore and Cuddapah districts were discovered about 40 years ago, by Mr. Benjamin Heyne, whose report to Government, inserted in his *Tracts on India*, gives the fullest and most satisfactory account of them.

"Mr. Heyne seems to have been wrong in imagining, that the natives had only discovered these mines 50 or 60 years before (about 1750). Mr. Kerr, who has since visited the whole of the mining district, and examined all the formations, and the old works, with great care, states, that the former excavations are of prodigious magnitude, many of them occupying several hundred feet square, and having a depth of 50 or 60 feet. The matrix rock and rubbish are now accumulated in these immense tanks; but on clearing them away, the mouths of the galleries extending into the rocks were discovered; blocks of the ore, (perhaps some that had been gathered previous to the discontinuance of working the mines from some political convulsion or oppression,) have been used to mend the village tank at *Guramanypenta;* and Mr. Kerr imagines that any quantity of the richest ore† may be obtained at a trifling expence, and within 100 feet of the surface. Extensive hills, formed of lumps of ferruginous slag, now covered with vegetation, point out the situation of the ancient smelting houses. A piece of this slag (which was at first mistaken for a volcanic product) was analysed by myself. It yielded but faint traces of copper, shewing that the native processes of extraction, however rude, were effectual in completely separating the metal. But I must now proceed to observe upon the actual specimens of the ore submitted to my examination, purposely avoiding all allusion to the mercantile value of the mines, the estimates of the expence of working them, and the invitations to join in an association for this purpose:—objects which are highly interesting to the community, connected with so laudable a measure for developing the natural riches of the country; but which cannot with propriety be entered upon in a work devoted exclusively to literature and science.

"The ores now presented to me are from three different localities. They differ considerably in quality one from the other, and all from the former ore, which Dr. Thomson pronounced to be an anhydrous carbonate, new to mineralogy.

"No. 1. A parcel, weighing 90lbs. of roughly-picked and cleaned ore, has a quartzose matrix, in some parts colored green, or appearing so from the malachite beneath the transparent crystal. It contains

* See Proceedings of the Asiatic Society, Feb. 1833, in vol. ii. p. 95.

† The "steel-grained, crystalized silvery ore, invariably found in green-stone slate, and partly imbedded in quartz, the richest ore met with," is doubtless No. 3, the sulphuret.—J. P.

much iron, which, on solution in an acid, appears in the form of a yellow ochre. Ten per cent. of quartz was separated from this specimen on pounding it roughly, before setting it apart for analysis.

"No. 2. A parcel of the same weight is labelled "*Bungeral Mettah,*" and is the species stated to be found in clustered nodules in the alluvium, of rounded exterior, as though they had been detached from their original site, and reburied here. The ferruginous matrix of this ore, on solution, assumes the appearance of a dark-red oxide. It is the same probably as that of Dr. Thomson's specimen. The carbonate of copper runs through it in veins, but the mixture of sulphuret of iron and perhaps of copper with the oxide, gives the whole a dark arenaceous texture.

"No. 3. The richest ore of the three is at the same time the most abundant, and promises to yield the safest return, as it runs in unbroken veins. This ore is a combination of carbonate and sulphuret, the former intermixed with the latter, but readily distinguishable from it, as the sulphuret is crystallized, and has the grey metalic lustre of galena. The specific gravity of this ore is 3·77, being intermediate between that of the carbonate, 3·2, and the sulphuret, 4·5.

"The analysis was conducted for the sake of expedition on separate parcels of 100 grains each, in lieu of attempting the separation of the ingredients from a single parcel. Some variation may thus be induced from the irregularity of the ore; but, on the whole, the results ought to be more trust-worthy. Thus: the carbonic acid was estimated by the loss of weight on digesting 100 grains, finely pounded, in dilute nitric acid. The water, (for none of these ores was found to be anhydrous,) by heating in a glass tube, removing the aqueous vapour by bibulous paper, and ascertaining the loss. As the ore generally lost its green colour by this operation, it is possible that a portion of carbonic acid was also driven off. Calcination in an open dish, in the muffle of an assay furnace, gave a loss, which was compounded of that of the carbonic acid and the water. Calcination drives off the sulphur also, but the equivalent of oxygen, which replaces it, being of precisely equal weight, this operation affords no test of the quantity of sulphur present.—In fact, not expecting from Dr. Thomson's analysis, to find sulphur in the Nellore copper ore, I at first neglected the precautions necessary for its separation. This was accordingly effected on other samples, by boiling in strong nitric acid, which from its heat, caused part of the sulphur in a pure state to rise in fused globules to the surface: while a portion, being oxygenated, was afterwards separated by precipitation with barytes.

"The quantity of copper was most conveniently estimated from the black oxide taken up from the calx by dilute nitric acid. It was also obtained directly from other samples by reduction of the oxide with charcoal and borax.—The iron and pyrites were deduced from the difference between the residue in the cold solution, and that from the hot dissolution in strong acid of another parcel, before calcination.

"Collecting together the results of the above operations, we have the following data, whence to deduce the composition of the three specimens.

	No. 1.	*No.* 2	*No* 3.
a. Loss of carbonic acid by digestion in dilute nitric acid,	12.0	14.6	7.0
b. Loss of water (and some carb. acid ?) by heating without air in glass tube,	5.0	7.0	3.0
c. Total loss on calcination with access of air,	17.5	17.8	21.0
c 2. Ditto average of two other trials (more carbonate,)	20.0	20.3	23.5
d. Oxide of copper taken up from calx *c* by dilute acid,	37.7	49.2	73.7
e. Residue of insoluble earths and ox. iron, after *d*,	44.8	33.0	5.3*
f. Residue from digestion of crude ore in boiling nitric acid,	20.0	13.9	19.0
g. The same, after burning off the sulphur and redigesting in do	20.0 ?	8.5	0.0
h. Sulphur, separated on boiling in strong acid,	0.6	2.1	9.0
i. Sulphate of barytes precipitated afterwards,	1.4	17.8	28.5
k. Weight of metallic copper actually recovered from *c* 2,	28.5	52.2	59.0

"In regard to *d*, No. 3, it was observed on digestion in cold nitric acid, that a very considerable portion of the calx of copper was of a red color, or in the state of protoxide, or perhaps in a metallic state, and was not taken up without disengagement of nitrous gas;—the weight 73.7 must therefore be increased, to give the true weight in terms of the peroxide. This is also proved by the amount of loss in *c*, 21.0, which is considerably in excess; and it was remarked on removing the calx from the fire that it was agglutinated, so as perhaps to have prevented the access of air to oxidate the interior.—The sulphur enables us to approximate the correction of this item; for 12.8 requires 51.5 copper,=64.3 black or peroxide; and this, added to 22.8, the peroxide of the carbonate, would give 87.7; which is 14.0 greater than the actual return from the fire.—Again, deducting the deficiency after calcination (*c*) 21.0, from the sum of the three volatile ingredients—sulphur, 12.8; carbonic acid, 7.0; and water 3.0=22.8, there remains but 1.8 for the weight of oxygen absorbed in place of the sulphur; whereas 12.8 are required.—Adding the difference 11.0 to *d*, we shall have 84.7. This number will be found to be a little in defect from the subsequent results; while 87.7 is a little too great; a mean may therefore be adopted.

* This residue may have consisted partly of sulphuret of copper that had escaped decomposition in the fire; for another specimen was wholly soluble, and little iron was present in the solution.

" From the above data, we may now proceed to extract the simple elements of each specimen of ore:

	No. 1.	*No.* 2.	*No.* 3
l. Metallic copper, calculated from the oxide *d*,..........................	30.2	39.5	69.0
m. Pure sulphur, from *h* and *i*,............	0.8	4.5	12.3
n. Carbonic acid, less $\frac{1}{10}$th for hygrometric moisture,......................	10.8	13.1	6.3

" The carbonic acid being supposed to be wholly combined with copper, while the sulphur may be partly united with iron, we may calculate the proportions of the carbonates and sulphurets by means of the scale of chemical equivalents, thus:

	No. 1.	*No.* 2.	*No.* 3.
o. The carbonic acid will require copper,..	31.4	38.6	18.3

" Now in the first two of these, the copper required so nearly agrees with the calculated weight of metal, *l*, that the latter may be looked upon as existing here wholly in the form of carbonate, and the suphur as united entirely with iron*. In No. 3, however, we find that the majority of the copper remains; and knowing the nearly total absence of iron in this specimen, we may conclude it to be a mixture of nearly two parts sulphuret, with one of carbonate.

" The miner would rest content with the determination of the pure metal in the ore, and would have good reason to be satisfied with the 60 per cent. "actual yield" of No. 3, or even with the 30 per cent. of the poorest of the three ores; but the mineralogist will prefer an exhibition of the component salts of the ores, according to the usual synthetical formula. I may here remark, that the water separated *(b)* is more than is required to convert the carbonate into a hydrate or ordinary malachite: thus,

	No. 1.	*No.* 2.	*No.* 3.
p. The copper combined with carbonic acid being,............................	30.2	39.5	18.3
q. Will require water to hydrate it,........	4.2	5.5	2.6

The excess in *b* may have been carbonic acid, partially driven off.

" The chemical composition of the three minerals may therefore be thus expressed:

	No. 1.	*No.* 2.	*No.* 3.
Hydrated carbonate of copper,............	52·4	68·5	31·7
Sulphuret of copper,......................	0·	0· ?	63·0
Sulphuret of iron,.........................	2·1	12·4	0·0
Oxide of iron, silex,&c....................	43·5	25·1	5·3
Loss or excess,...........................	2·0	—6·0	0·0
	100·0	100·0	100·0

* In the second Analysis of No. 2, however, the copper actually recovered, *k*, so much exceeds this quantity, that it is evident this ore frequently contains sulphuret, or is of very variable quality.

" The excess in No. 2, is doubtless owing to the irregularity of the rocky admixture in different specimens, whereof one yielded 44, and another only 13.9 of insoluble matter, on digestion in acid.

" The richness of the last of the three minerals will more than compensate for the increase of trouble and expence in the reduction of the ore by successive roastings; and practical miners assert, that the glance or grey sulphuret is a much steadier and more plentiful ore than the carbonate.

" I should add, before concluding the above imperfect analysis of the Nellore copper ores, that I tested them in vain for silver and other metals. Neither did arsenic appear to be present.

" I may here mention, that among the specimens of minerals presented to me by Mr. Kerr, as occuring within the copper mining district, associated with the micaceous schist, are the following; corundum and adamantine spar, garnets, dark-green actinolite, red chalk, manganese; besides carbonote of magnesia, and other minerals of which specimens have not yet reached me. An ore of mercury is also suspected to exist in the same range of rocks. The surface of the gneiss or micaceous schist, where exposed to the air, is frequently seen tinged of a green colour, from the trickling of water holding carbonate of copper in solution, through crevices of the rock."

7. Water of the well zem-zem at Mecca.

May 14.—A paper was read, entitled, " An Account of the Water of the Well *Zem-zem*, with a qualitative analysis of the same by Professor Faraday"; in a letter from John Davidson, Esq., to the Secretaries, and communicated by them.

" The author having, during his stay at Jedda, the port of Mecca, succeeded in procuring about three quarts of the water from the well of *Zem zem*, to which the Mahomedans ascribe a sacred character and extraordinary virtues; and wishing to preserve this water for the purposes of analysis, had the can in which it was contained carefully sealed; but, unfortunately, on its arrival in the London Docks, the can notwithstanding the directions written on it, was opened, and the gas with which it was highly charged, and by which it held in solution a very large quantity of iron and other matters, was allowed to escape. The precipitate thrown down, in consequence of the loss of this gas, was found, by Professor Faraday, to consist of carbonate of protoxide of iron in the enormous proportion of 100.8 grains to the imperial pint of water. The clear fluid was neutral, and contained much muriate, and a little sulphate, but no carbonate; together with a little lime, potash, and soda. There was also found an alkaline nitrate in considerable quantity; this Mr. Faraday conjectures to have been saltpetre, which had been added to the water by the priests."

Transactions of the Royal Society.